Volume 31 JUNE, 1947 Number 6

BULLETIN
of the
American Association *of* Petroleum Geologists

CONTENTS

REVIEW OF EXPLORATION AND DEVELOPMENT IN 1946

STATISTICS OF EXPLORATORY DRILLING IN 1946 *BY FREDERIC H. LAHEE* 917

CALIFORNIA *BY GRAHAM B. MOODY* 931

CANADA *BY FRANK L. FOURNIER* 947

APPALACHIANS *BY APPALACHIAN GEOLOGICAL SOCIETY* 959

ILLINOIS AND INDIANA *BY ALFRED H. BELL AND RALPH E. ESAREY* 979

MICHIGAN *BY H. J. HARDENBERG* 988

NORTH MID-CONTINENT *BY EDWARD A. KOESTER AND VIRGIL B. COLE* 999

OKLAHOMA *BY R. J. CULLEN* 1006

TEXAS PANHANDLE *BY P. A. GRANT AND A. W. DOSHIER* 1015

WEST TEXAS AND SOUTHEASTERN NEW MEXICO *BY R. L. BOSS AND W. J. HILSEWECK* 1018

ARIZONA, WESTERN AND NORTHERN NEW MEXICO *BY ROBERT L. BATES* 1039

NORTH AND WEST-CENTRAL TEXAS *BY JAMES F. GIBBS AND CLAUDE D. SMITH* 1045

SOUTH TEXAS *BY BRUCE SCRAFFORD* 1052

EAST TEXAS *BY T. C. CASH AND G. J. LOETTERLE* 1059

UPPER GULF COAST OF TEXAS *BY A. P. ALLISON AND C. B. CLAYPOOL* 1071

LOUISIANA GULF COAST *BY G. FREDERICK SHEPHERD* 1078

ARKANSAS AND NORTH LOUISIANA *BY JOHN R. WILLIAMS* 1084

ATLANTIC COAST STATES *BY HORACE G. RICHARDS* 1106

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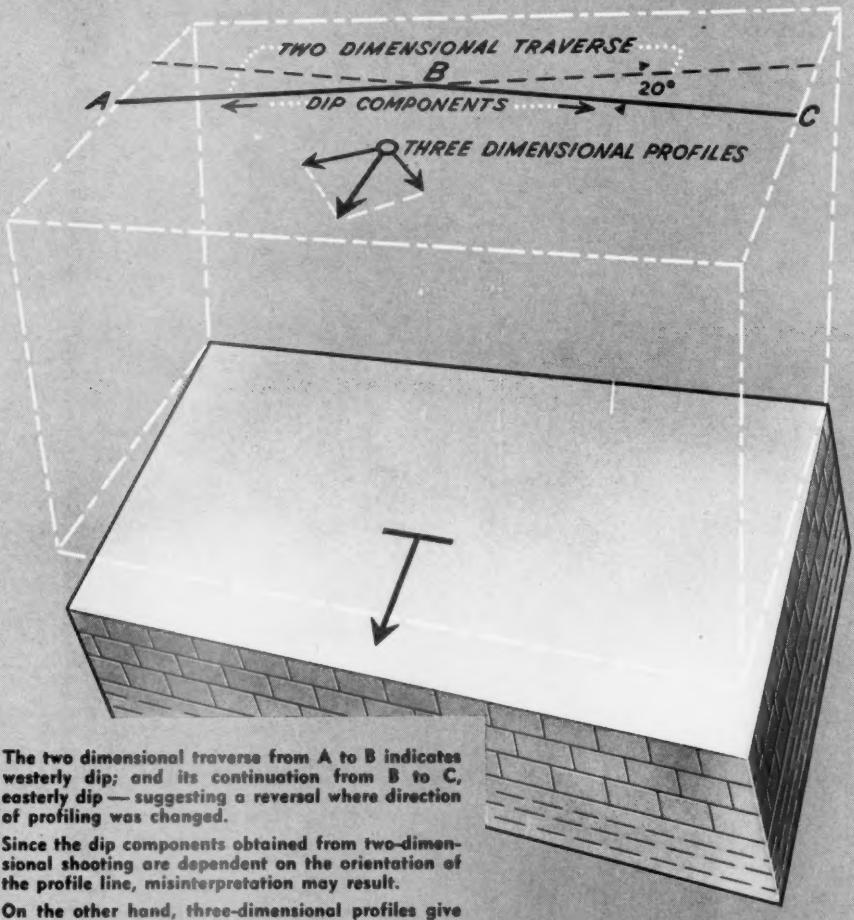

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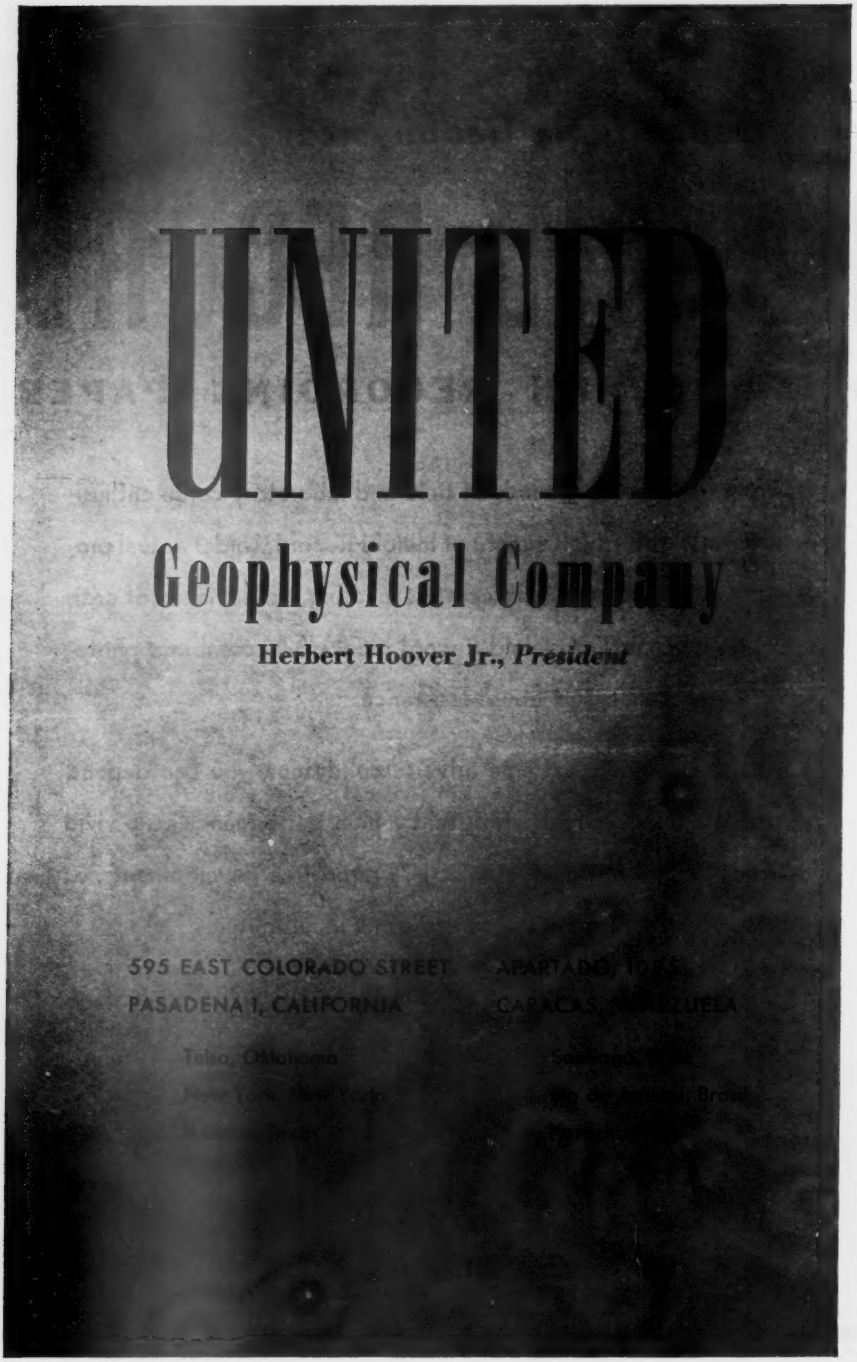
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That he got one, too, . . . on me.

June 1947

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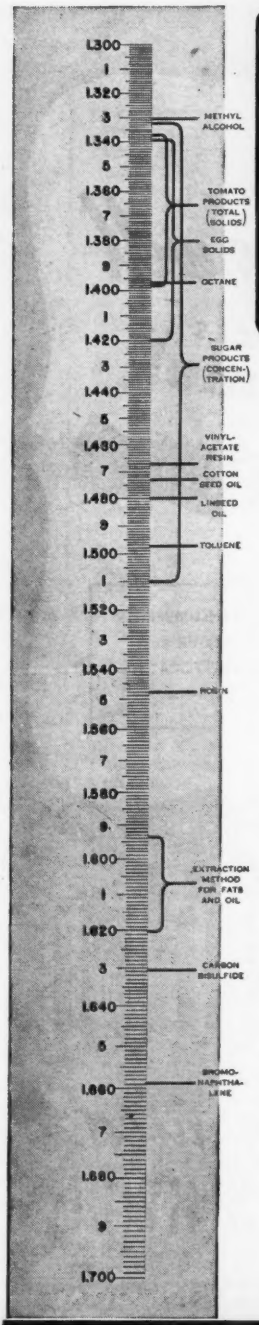

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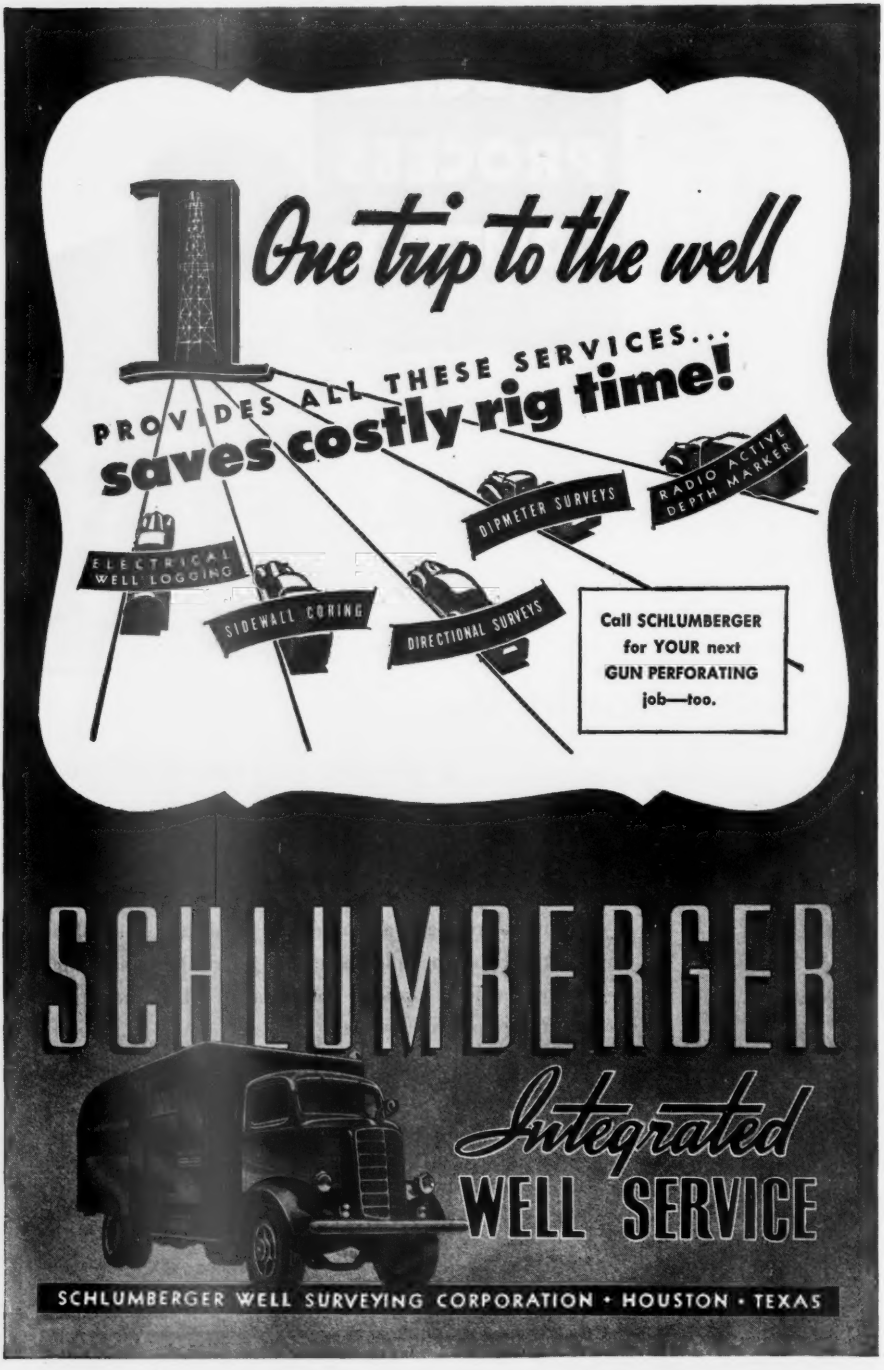
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Aero Service Corporation xxii
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Atlas Powder Company liii
Baker Oil Tools, Inc. .....
Baroid Sales Division xxix
Barret, William M., Inc. xxiii
Bausch and Lomb Optical Company .....
Colorado School of Mines li
Dowell Incorporated .....
Drilling and Exploration Company xlix
Eastman Oil Well Surveys xlv
Economic Geology Publishing Company ..xxii
Failing (Geo. E.) Supply Company .....
Fairchild Aerial Surveys xliii
First Natl. Bank and Trust Co. of Tulsa xxiv
C. H. Frost Gravimetric Surveys xlv
General Geophysical Company xxviii
Geophysical Service, Inc. viii
Geotechnical Corporation xlii
Gravity Meter Exploration Company xli
Haloid Company iii
Heiland Research Corporation xxxvi
Hercules Powder Company, Inc. .....
Hughes Tool Company .....Cover iv
Independent Exploration Company xl
Journal of Geology .....
Journal of Paleontology xlii
Journal of Sedimentary Petrology xlii
Kelly, Geo. F. (Maps) xxvi
Keystone Exploration Company xxvii
Lane-Wells Company xxv
Laughlin-Simmons and Company xliv
Mayes-Bevan Company .....facing iv
McCollum Exploration Company .....
National Geophysical Company xlviii
North American Geophysical Company ..xxxv
Oil Base, Inc. lv
Petty Geophysical Engineering Company xxxix
Reed Roller Bit Company .....Cover iii
Republic Exploration Company xxxi
Robert H. Ray Co. xxxii
Rogers-Ray, Inc. xxxiii
Schlumberger Well Surveying Corporation ..vi
Seismic Engineering .....
Seismic Explorations, Inc. xxxiv
Seismograph Service Corporation ....Cover ii
Society of Exploration Geophysicists xxii
Southern Geophysical Company .....
Sperry-Sun Well Surveying Company ...xxxvii
Sullivan Division, Joy Mfg. Co. .....xx-xxi
Thompson Tool Company, Inc. .....
Tobin Aerial Surveys xliv
Triangle Blue Print and Supply Company ...
United Geophysical Company iv
Universal Exploration Company xlii
Western Geophysical Company xxx

PROFESSIONAL CARDS

Alabama ix
California ix
Colorado .....ix-x
Illinois x
Indiana x
Kansas x
Louisiana x
Maryland x
Mississippi xi
Montana xi
New Mexico xi
New York xi
North Carolina xi
Ohio xi
Oklahoma .....xi-xii
Pennsylvania xii
Texas ....xii, xiii, xiv, xv, xvi
West Virginia xvi
Wyoming xvi

GEOLOGICAL AND GEOPHYSICAL SOCIETIES

Appalachian xix
Ardmore xviii
Corpus Christi xviii
Dallas xviii
East Texas xix
Exploration Geophysicists xviii
Fort Worth xix
Houston xix
Illinois xvii
Indiana-Kentucky xvii
Kansas xvii
Michigan xvii
Mississippi xvii
New Orleans xvii
North Texas xix
Oklahoma City xviii
Pacific Section xviii
Panhandle xviii
Pittsburgh xviii
Rocky Mountain xvi
Shawnee xviii
Shreveport xvii
Southeastern xvi
South Texas Section xix
South Louisiana xvii
Tulsa xviii
West Texas xix
Wyoming xix

Articles for July *Bulletin*

Geological Masks and Prejudices	By Earl B. Noble
Whither Exploration	By J. J. Jakosky
Highlights of Domestic Development in 1946	By K. C. Heald
Highlights on Developments in Foreign Petroleum Fields	By L. G. Weeks
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Middle Ordovician Limestones in Central Kansas	By Hall Taylor

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Volume 31 Number 6

BULLETIN
of the
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

JUNE, 1947

EXPLORATORY DRILLING IN 1946[1]

FREDERIC H. LAHEE,[2] *Chairman*
Dallas, Texas

ABSTRACT

This is the second annual report on data gathered by the committee on statistics of exploratory drilling.

During 1946, 5,752 exploratory holes were drilled in the United States. Of these, 3,125 were new-field wildcats, 1,270 were new-pool tests (including new-pool wildcats, deeper-pool tests, and shallower-pool tests), and 1,357 were outposts. Among the new-field wildcats, 333 were successful; among the new-pool tests, 380 were successful; and among the outposts, 424 were successful.

The total exploratory footage drilled was 22,167,561 feet in the 5,752 holes, or 3,854 feet per hole. These figures are comparable with 23,030,266 feet drilled in 5,613 exploratory holes, with an average depth of 4,103 feet, in 1945.

This is the second annual report on data gathered and compiled by the committee on statistics of exploratory drilling. It is the tenth article of its kind, written by the same author and printed each year in the June issue of this Association *Bulletin*. The earlier articles are listed on page 813 of the *Bulletin* for 1946. Special attention is called to the "Review of Exploratory Drilling Statistics, 1938–1944," which appeared in the November issue of the *Bulletin* in 1945.[3]

There is no need to repeat what we stated last year in regard to the organization of the committee on statistics of exploratory drilling. To the members of the main committee, and also to the numerous persons who helped on subcommittees, the chairman is happy to express his thanks for their able assistance. Following is a list of the committee members and others who contributed to the work.

Robert L. Bates, assisted by John A. Frost
A. H. Bell, assisted by Virginia Kline, Nancy McDurmitt, and Richard J. Cassin
Kenneth C. Cottingham
R. J. Cullen, assisted by Floyd L. Swabb
Stanley G. Elder, assisted by Fred H. Mumford and R. L. Denton
Ralph E. Esarey
F. H. Finn, assisted by George C. Grow (vice-chairman of Finn's subcommittee), George J.

[1] Read before the Association at Los Angeles, March 27, 1947. Manuscript received, March 15, 1947.

[2] Chief geologist, Sun Oil Company; chairman, committee on statistics of exploratory drilling.

[3] Vol. 29, No. 11, pp. 1581–92.

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W. J. Hilseweck, assisted by R. L. Boss, Jack A. Parker, and Laura L. Tolsted
Coleman D. Hunter, assisted by Frank Fisher, Woodson Diamond, and Miss Bill Dyer
John W. Inkster, assisted by Paul H. Harper and John R. Berg
Robert C. Lafferty, assisted by J. D. Castner
W. S. McCabe, assisted by E. W. Krampert, R. L. Sielaff, Ray Larson, A. W. Cullen, and H. E. Christensen
John C. Miller, assisted by S. A. Berthiaume, O. L. Bocock, and E. B. Wilson
Clarence L. Moody, assisted by G. W. Burdick and R. M. Wilson
Graham B. Moody, assisted by T. J. Fitzgerald, H. W. Lee, A. J. Solari, E. H. Rader, R. L. Rist, and F. B. Carter
D. J. Munroe
T. F. Petty, assisted by Virgil Pettigrew
Charles H. Row, assisted by L. C. Smith, J. M. Hansell, and Mary E. Sheldon
Glenn C. Sleight, assisted by George D. Lindberg
Paul Weaver
C. W. Wilson, Jr., assisted by H. B. Burwell and H. C. Milhous

Our committee has used the classification of exploratory holes as outlined in Table I. Definitions of the several types of hole are given on pages 631 to 634 of

TABLE I

CLASSIFICATION OF EXPLORATORY WELLS

				Classification when Drilling is Started	*Classification after Completion or Abandonment*	
					Successful	*Unsuccessful*
				A	*B*	*C*
Drilling for long extension of partly developed pool				1 Outpost	1 Extension well (sometimes a new-pool discovery well)	1 Dry outpost well
Drilling for a *new pool* on a structure or in a geological environment already productive	New-pool tests	Drilling within limits of area of pool	For new pool *above* deepest pool	2a Shallower-pool test	New-pool discovery wells: 2a Shallower-pool discovery well	Dry new-pool tests: 2a Dry shallower-pool test
			For new pool *below* deepest pool	2b Deeper-pool test	2b Deeper-pool discovery well	2b Dry deeper-pool test
		Drilling outside limits of developed pools		2c New-pool wildcat	2c New pool discovery wildcat (sometimes an extension well)	2c Dry new-pool wildcat
Drilling for a *new field* (on a structure or in an environment never before productive)				3 New-field wildcat	3 New-field discovery wildcat	3 Dry new-field wildcat

the summary for 1944[4]. Except where otherwise designated, the statistics recorded in this paper are similar to those used in our reports for 1939 to 1945 inclusive.

[4] "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), pp. 629–45.

We include wildcats (both new-field wildcats and new-pool wildcats), outpost wells, deeper-pool tests, and shallower-pool tests. For all but the deeper-pool tests we use, as exploratory footage, the total footage drilled in each hole, whether a producer or a dry hole, but in the case of the deeper-pool tests we include only the footage drilled below the deepest producing formation penetrated by the well. Observe that if, in the drilling of wells in a given field, any *dry* footage is drilled *below* the deepest producing sand ("pay"), the stratigraphic equivalent of this dry footage in a subsequently drilled deeper-pool test is counted as exploratory. Thus, even though a field-develpoment well, "A," may have been carried from, let us say, 5,000 feet, which we shall assume is the base of the deepest pool in the field, to 6,000 feet, and plugged back for completion at 5,000 feet, a deeper-pool test, "B," drilled near this well "A" and carried to 8,000 feet would still have assigned to it 3,000 feet of exploratory footage. This is analogous to the case of a second new-field wildcat, "D," drilled offsetting, or close to, a dry and abandoned previously drilled new-field wildcat, "C," for "D," just like "C," is assigned its entire depth, from the surface down to the bottom, as exploratory footage.

There still seems to be a feeling among some geologists, but more especially among executives and others who are not geologists, that this classification is too complex. We wish to reiterate here—what we have previously said—that this classification, after long and very intensive study of the whole problem by a large number of geologists, is the simplest form in which all five types of exploratory hole are designated. Any further simplification would result in combining of two or more classes and would, therefore, conceal certain information which the geological profession needs if it is fully to appraise the results of its recommendations. As long as the statistics are collected and classified under the five headings (see Table I), anybody can then total them in groups as he sees fit.

After all, this five-way classification is not so difficult to understand if attention be given to the following definitions. All holes drilled below ground may be grouped as (1) those drilled for oil or gas, or (2) those drilled for other purposes. All holes drilled for oil or gas may be classed as (1) those which are *field-development wells*, located within or close to the developed part of an oil pool or gas pool (within the area of proved reserves), and drilled further to develop the pool or pools already partly developed; or (2) those which are *exploratory* in the sense that they are searching for new and as yet undiscovered pools or are searching for *long* extensions of pools already partly developed. We are here concerned only with the exploratory holes.

All exploratory holes are drilled either (1) on structures not yet producing, or (2) on structures already producing. Holes of the first of these two classes are new-field wildcats. Occasionally, where structures are ill-defined and porosity varies considerably within relatively short distances, exploratory holes may be grouped here if they are two miles or more distant from the nearest production. Holes of the second class (on structures already producing) may be (1) *outside*

the developed area (area of proved reserves), in which case they will be outposts or new-pool wildcats according to whether they are drilled to extend a partly developed pool (reservoir) or to explore for a new pool; or (2) *within* the "proved" developed area of the pool, in which case they may be deeper-pool tests (exploring *beneath* the deepest pool penetrated by the hole) or shallower-pool tests (exploring for a new pool *above* the deepest developed pool at the sites of the well in question). There are very few holes that belong to this fifth class. Most of the wells of this kind are field-development wells that happen to find new shallower pools. In other words, such holes were not drilled for the purpose of exploring for a shallower reservoir. Only rarely is such exploration undertaken.

On the maps (Figs. 1 and 2), numbers in parentheses indicate total footage drilled; figures preceding parentheses indicate the number of holes drilled; figures above the cross line are for producing wells, that is, oil, oil and gas, condensate (distillate) and gas, and gas; and figures below the cross line are for dry holes.

In the states covered in this review, as shown in Figure 1, and listed in Table II, during 1946 a total of 22,167,561 feet was drilled in 5,752 exploratory holes, divided as follows.

	Feet
1,137 producers	5,286,711
4,615 dry holes	16,880,850

This means that 19.8 per cent of the holes drilled, and 23.8 per cent of the footage drilled, were successful in 1946. One producer foot was drilled for every 3.19 feet of dry hole. One successful well was drilled for every 4.06 dry holes. The average depth of hole was 3,854 feet.

In the southern states district (Fig. 2), in 1946, a total of 12,580,476 feet was drilled in 2,635 holes, divided as follows.

	Feet
538 producers	3,276,458
2,097 dry holes	9,304,018

In this area, then, 20.4 per cent of the holes drilled, and 26.0 per cent of the footage drilled, were successful. One producer foot was drilled for every 2.84 feet of dry hole. One successful well was drilled for every 3.89 dry holes. The average depth of hole was 4,774 feet. For comparison with statistics for this same area in 1938, 1939, 1940, 1941, 1942, 1943, 1944, and 1945, see Table III.

Selection of the location for a wildcat well may be based on geology (surface geology, subsurface geology, trend along known structural or stratigraphic conditions, local or regional, or shallow exploratory drilling); or it may be based on geophysics (exploration by seismograph, torsion balance, gravity meter, magnetometer, *et cetera*); or it may be based on some non-technical suggestion or requirement, such as "creekology," "hunch," "doodle-bug," promotion, lease obligation, reported showing of oil or gas in holes previously drilled, *et cetera*. In many cases a block of leases is taken on trend, or gravity exploration, or magnetic exploration, *et cetera*, and subsequently the well is located within the block by some more detailed work, such as seismic exploration. We believe that

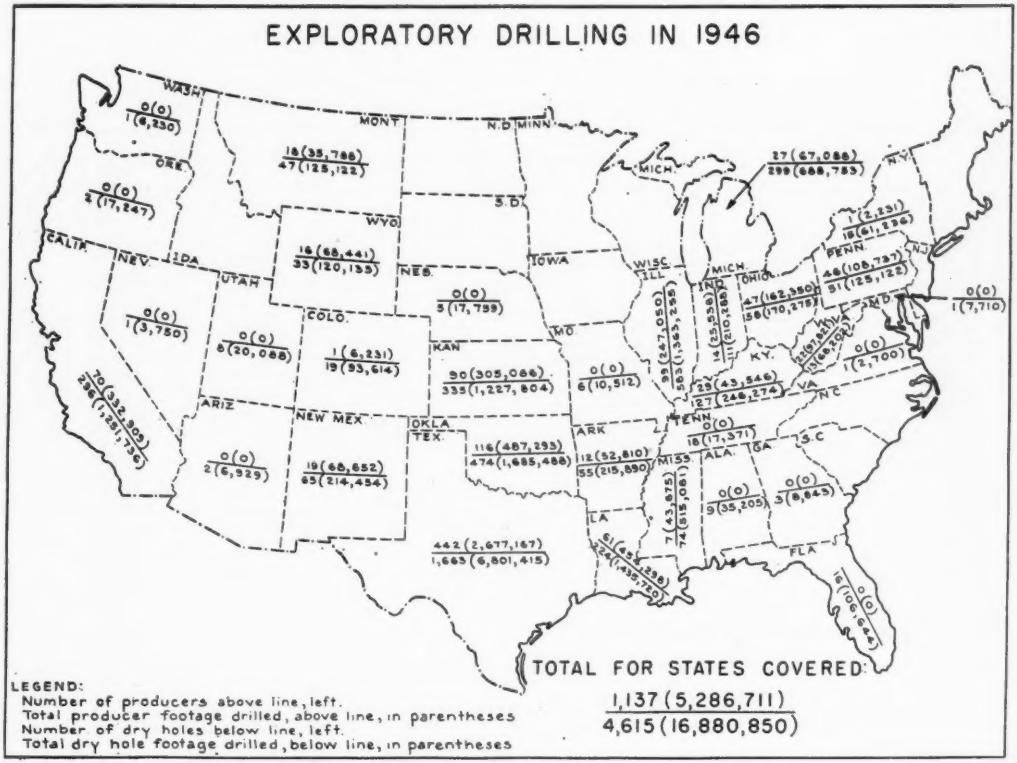

EXPLORATORY DRILLING IN 1946
WASH
0(0)
1(6,230)
ORE.
0(0)
2(17,247)
CALIF.
70(332,809)
286(1,281,736)
NEV.
0(0)
1(3,750)
IDA.
UTAH
18(68,441)
33(120,133)
ARIZ.
0(0)
2(6,929)
COLO.
0(0)
6(20,088)
NEW MEX.
19(68,652)
65(214,454)
MONT.
18(35,788)
47(125,122)
WYO.
1(6,231)
19(93,614)
N.D.
S.D.
NEB.
0(0)
5(17,739)
KAN.
90(305,066)
335(1,227,804)
OKLA.
116(487,293)
474(1,685,488)
TEX.
442(2,677,167)
1,663(6,801,415)
MINN.
IOWA
MO.
0(0)
6(10,512)
ARK.
12(52,810)
55(215,890)
LA.
61(454,298)
224(1,435,720)
WISC.
ILL.
MICH.
IND.
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.VA.
OHIO
PENN.
N.Y.
MD.
N.J.
DEL.
27(67,086)
299(668,783)
1(2,251)
18(61,236)
46(108,737)
91(125,122)
47(162,350)
186(710,278)
0(0)
1(7,710)
0(0)
2(700)
0(0)
18(17,371)
0(0)
9(35,205)
0(0)
3(8,843)
16(106,644)
0(0)
7(43,675)
74(515,081)
TOTAL FOR STATES COVERED:
1,137(5,286,711)
4,615(16,880,850)
LEGEND:
Number of producers above line, left.
Total producer footage drilled, above line, in parentheses
Number of dry holes below line, left.
Total dry hole footage drilled, below line, in parentheses

FIG. 1

SE. NEW MEXICO
16(48,508)
53(185,220)
OKLAHOMA
4(11,164)
20(110,034)
64(231,915)
354(1,070,395)
112(790,928)
159(838,501)
28(100,270)
193(518,740)
9(50,840)
55(231,765)
12(92,518)
58(353,415)
ARKANSAS
12(52,810)
55(215,890)
LOUISIANA (NORTH)
27(193,840)
22(387,835)
LOUISIANA (SOUTH)
34(298,658)
102(847,885)
MISSISSIPPI
7(43,675)
74(515,081)
ALABAMA
0(0)
9(35,205)
GEORGIA
0(0)
3(8,843)
SOUTH CAROLINA
TOTAL LOUISIANA
61(454,298)
224(1,435,720)
16(106,644)
0(0)
FLORIDA
TOTAL
538(3,276,458)
2,097(9,304,018)
ONE PRODUCER FOOT
FOR EVERY
2.84 FEET DRY
TEXAS
10(39,080)
53(195,459)
95(731,212)
222(1,551,795)
15(53,643)
102(293,758)
23(217,782)
37(391,193)
60(357,814)
314(1,095,383)
TOTAL TEXAS:
442(2,677,167)
1663(6,801,415)
EXPLORATORY WELLS, 1946
① • TEXAS RAILROAD COMMISSION DISTRICTS

FIG. 2

TABLE II

NUMBER OF OIL WELLS, GAS WELLS, CONDENSATE WELLS, AND DRY HOLES DRILLED AS EXPLORATORY TESTS IN 1946

States*	Oil Producers		Gas Producers		Condensate Producers		Total Producers		Dry		Grand Totals		Average Depth of Hole[1]
	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	
Alabama	0	0	0	0	0	0	0	0	9	35,205	9	35,205	
Arizona	0	0	0	0	0	0	0	0	2	6,929	2	6,929	
Arkansas	11	49,295	1	3,515	0	0	12	52,810	55	215,890	67	268,700	4,010
California	55	278,215	14	53,494	1	1,200	70	332,909	296	1,251,736	366	1,584,645	4,329
Colorado	1	6,231	0	0	0	0	1	6,231	19	93,614	20	99,845	
Florida	0	0	0	0	0	0	0	0	16	106,644	16	106,644	
Georgia	0	0	0	0	0	0	0	0	3	8,843	3	8,843	
Illinois	96	244,761	3	2,289	0	0	99	247,050	583	1,363,255	682	1,610,305	2,361
Indiana	14	25,538	0	0	0	0	14	25,538	111	210,288	125	235,826	1,887
Kansas	59	204,775	31	100,311	0	0	90	305,086	335	1,227,804	425	1,532,890	3,607
Kentucky	20	30,443	9	13,103	0	0	29	43,546	127	246,274	156	289,820	1,858
Louisiana	21	134,094	10	67,451	30	252,753	61	454,298	224	1,435,720	285	1,890,018	6,632
Maryland	0	0	0	0	0	0	0	0	1	7,710	1	7,710	
Michigan	16	41,309	10	20,472	1	5,307	27	67,088	299	688,753	326	755,841	2,319
Mississippi	4	37,367	2	4,938	1	1,370	7	43,675	74	515,081	81	558,756	6,898
Missouri	0	0	0	0	0	0	0	0	6	10,512	6	10,512	
Montana	12	21,749	6	14,039	0	0	18	35,788	47	125,122	65	160,910	2,476
Nebraska	0	0	0	0	0	0	0	0	5	17,759	5	17,759	
Nevada	0	0	0	0	0	0	0	0	1	3,750	1	3,750	
New Mexico	12	35,960	7	32,692	0	0	19	68,652	65	214,454	84	283,106	3,370
New York	0	0	1	2,231	0	0	1	2,231	15	61,236	16	63,467	
Ohio	8	32,355	39	129,995	0	0	47	162,350	58	170,275	105	332,625	3,168
Oklahoma	91	395,791	25	91,502	0	0	116	487,293	474	1,685,488	590	2,172,781	3,683
Oregon	0	0	0	0	0	0	0	0	2	17,247	2	17,247	
Pennsylvania	10	17,798	36	90,939	0	0	46	108,737	51	125,122	97	233,859	2,411
Tennessee	0	0	0	0	0	0	0	0	18	17,371	18	17,371	
Texas	318	1,854,278	68	365,176	56	457,713	442	2,677,167	1,663	6,801,415	2,105	9,478,582	4,503
Utah	0	0	0	0	0	0	0	0	8	20,088	8	20,088	
Virginia	0	0	0	0	0	0	0	0	1	2,700	1	2,700	
Washington	0	0	0	0	0	0	0	0	1	6,230	1	6,230	
West Virginia	2	3,446	6	24,230	14	70,145	22	97,821	13	68,202	35	166,023	4,744
Wyoming	12	41,541	4	26,900	0	0	16	68,441	33	120,133	49	188,574	3,848
Totals	762	3,454,946	272	1,043,277	103	788,488	1,137	5,286,711	4,615	16,880,850	5,752	22,167,561	3,854

* No exploratory drilling was reported in Iowa, North Carolina, North Dakota, South Carolina, or South Dakota.
[1] Averages have been recorded here only for states where more than 25 exploratory holes were drilled in 1946.

TABLE III

COMPARATIVE STATISTICS FOR SOUTHERN STATES, SHOWN IN FIGURE 2*

Year	Producers Drilled				Dry Holes Drilled				Total Number Explor. Holes Drilled	Total Feet Drilled	Average Depth of Hole (Feet)	Number of Dry-Hole Feet Drilled for Each Producer Foot
	Holes		Footage		Holes		Footage					
	Number	Per Cent	Feet	Per Cent	Number	Per Cent	Feet	Per Cent				
1938	200	13.6	984,262	17.4	1,271	86.4	4,667,402	82.6	1,471	5,651,664	3,842	4.74
1939	161	12.6	779,345	14.8	1,113	87.4	4,501,669	85.2	1,274	5,281,014	4,145	5.90
1940	187	12.8	919,506	14.9[1]	1,279	87.2	5,251,273[1]	85.1[1]	1,466	6,170,779	4,209[1]	5.71[1]
1941	258	16.5	1,264,774	18.4	1,305	83.5	5,578,975	81.6	1,563	6,843,749	4,372	4.41
1942	231	16.3	1,289,480	19.6	1,186	83.7	5,295,556	80.4	1,417	6,585,036	4,647	4.11
1943	287	17.3	1,546,956	18.8	1,369	82.7	6,680,512	81.2	1,656	8,227,468	4,968	4.32
1944	473	21.1	2,804,005	23.5	1,765	78.9	9,095,421	76.5	2,238	11,899,426	5,317	3.24
1945	613	22.7	3,508,301	26.1	2,093	77.3	9,944,302	73.9	2,706	13,452,603	4,971	2.83
1946	538	20.4	3,276,458	26.0	2,097	79.6	9,304,018	74.0	2,635	12,580,476	4,774	2.84

* In this table, New Mexico data are for the southeastern part of the state only.
[1] See *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 25, p. 1938, where corrections are mentioned for these figures as they appeared in Table II, p. 1001, of the same volume.

in such cases credit should be given to both the reconnaissance method and the detailed method of exploration. Sometimes the reason for choosing the location can not be ascertained, and it is then recorded as "unknown."

We wish to state to those who think that there is possibly too strong a geological bias in assigning the reasons for location of exploratory holes, that our committee members try to be fair and to be correct in this grouping. There is certainly no intentional effort to weigh the results of geology against those of

TABLE IV

BASIS FOR LOCATING EXPLORATORY HOLES DRILLED IN 1946

State	*Geology*		*Geophysics**		*Geology and Geophysics**		*Sundry Non-Technical*		*Unknown*		*Totals*		*Grand Total*
	Prod.	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	
Alabama	0	1	0	4	0	0	0	4	0	0	0	9	9
Arizona	0	0	0	0	0	0	0	2	0	0	0	2	2
Arkansas	6	35	4	10	2	3	0	2	0	5	12	55	67
California	55	193	5	18	8	43	1	28	1	14	70	296	366
Colorado	1	14	0	1	0	4	0	0	0	0	1	19	20
Florida	0	0	0	9	0	0	0	0	0	1	0	10	10
Georgia	0	0	0	2	0	0	0	1	0	0	0	3	3
Illinois	92	505	2	28	5	9	0	37	0	4	99	583	682
Indiana	9	70	2	2	1	1	1	18	1	20	14	111	125
Kansas	77	198	6	27	1	10	5	89	1	11	90	335	425
Kentucky	26	93	0	2	0	2	0	16	3	14	29	127	156
Louisiana	29	111	22	79	10	30	0	4	0	0	61	224	285
Maryland	0	1	0	0	0	0	0	0	0	0	0	1	1
Michigan	25	218	2	9	0	0	0	13	0	59	27	290	326
Mississippi	4	11	3	35	0	19	0	6	0	3	7	74	81
Missouri	0	0	0	0	0	0	0	0	0	6	0	6	6
Montana	15	39	0	3	1	0	1	4	1	1	18	47	65
Nebraska	0	2	0	2	0	0	0	0	0	1	0	5	5
Nevada	0	1	0	0	0	0	0	0	0	0	0	1	1
New Mexico	16	29	1	8	0	7	2	14	0	7	19	65	84
New York	1	12	0	0	0	0	0	3	0	0	1	15	16
Ohio	21	15	0	1	0	0	2	1	24	41	47	58	105
Oklahoma	51	226	46	63	12	3	3	180	4	2	116	474	590
Oregon	0	1	0	1	0	0	0	0	0	0	0	2	2
Pennsylvania	13	19	0	0	0	1	3	13	30	18	46	51	97
Tennessee	0	1	0	0	0	0	0	0	0	17	0	18	18
Texas	273	1,213	48	164	116	180	2	32	3	74	442	1,663	2,105
Utah	0	4	0	0	0	0	0	4	0	0	0	8	8
Virginia	0	0	0	0	0	0	0	0	0	1	0	1	1
Washington	0	0	0	1	0	0	0	0	0	0	0	1	1
West Virginia	16	11	0	0	0	0	2	2	4	0	22	13	35
Wyoming	12	24	1	4	2	0	1	5	0	0	16	33	49
Totals	742	3,053	142	473	158	312	23	478	72	299	1,137	4,615	5,752

* Including geochemistry.

geophysics. We want to give credit where it is due. Our main thought is to contrast the results of exploring on technical advice, on the one hand, with the results of exploring without technical advice, on the other hand.

In Table IV are listed the reasons for drilling the exploratory holes in 1946, by using the best information available from men familiar with such statistics, each in his own state or district. According to these figures 1,042 exploratory holes drilled on technical advice (geology and/or geophysics) were successful, and 3,838 were dry; 23 holes, located for non-technical reasons, were producers, and 478 were dry; 72 producers and 299 dry holes were located for reasons unknown. These figures show that 21.3 per cent of the holes drilled on technical advice were

producers as contrasted with 4.6 per cent successful in the case of the holes located without technical advice. Therefore, in 1946, locations based on technical recommendations were 4.6 times as successful as those drilled without such advice. With reference to new-field wildcats only, 154 producers and 1,583 dry holes were located mainly on geological bases; 91 producers and 412 dry holes were located on geophysics; 57 producers and 211 dry holes were located on geology plus geophysics; 10 producers and 363 dry holes were located on various non-technical bases; and 21 producers and 223 dry holes were located for reasons unknown. Either alone or in combination with geology, seismographic methods were responsible for 138 producers and 107 dry holes. Among new-field wildcats, 12 per cent of the holes drilled on technical advice were successful, and only 2.7 per cent of the holes drilled on non-technical advice were successful. These figures refer to totals for all the states reported (Fig. 1 and Table II).

Comparing last year's figures[5] with figures for 1946 we note the following.

1. There was a relatively small increase (2.47 per cent) in number of exploratory holes drilled in 1946, but a decrease (3.74 per cent)in the the total footage drilled.

2. There were conspicuous increases in the number of exploratory holes drilled in Illinois, Montana, and Oklahoma, and there were rather sharp drops in California, Mississippi, and New Mexico, these being considered more especially on a percentage basis rather than a well basis.

3. The average depth of hole decreased from 4,103 feet in 1945 to 3,854 feet in 1946.

As for several years past, again this year we shall refer to certain data pertaining to the group of seventeen states indicated in Figure 3 by diagonal northeast-southwest ruling. These seventeen states, each year from 1938 to 1946, inclusive, have included between 98 and 99 per cent of the proved oil reserves of the country. For this reason their study gives essentially a picture of conditions in the United States where we want to compare exploration activities and additions of new oil from year to year.

In Table V we present an analysis of the five classes of exploratory hole (Table I), and this is done both for the 17-states area and for the entire United States for 1945 and 1946. Observe that the percentages for both areas are very nearly the same for each year. This, of course, would be expected since so much of the exploratory drilling of the country occurs in these 17 states. Using round numbers for averages between these two years of 1945 and 1946, we may say that new-field wildcats constitute about 54.2 per cent of all the exploratory holes drilled; outposts about 22.6 per cent; new-pool wildcats about 15.4 per cent; deeper-pool tests about 7.2 per cent; and shallower-pool tests about 0.6 per cent. Together, then, the new-pool tests (the last three) would constitute 23.2 per cent of the total. Or, putting this in still more general form, we may say that exploratory drilling is roughly divisible into 54 per cent which is wildcatting for new fields, 23 per cent which is drilling for new pools on structures already producing, and 23 per cent

[5] F. H. Lahee, "Exploratory Drilling in 1945," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 30, No. 6 (June, 1946), pp. 813–28.

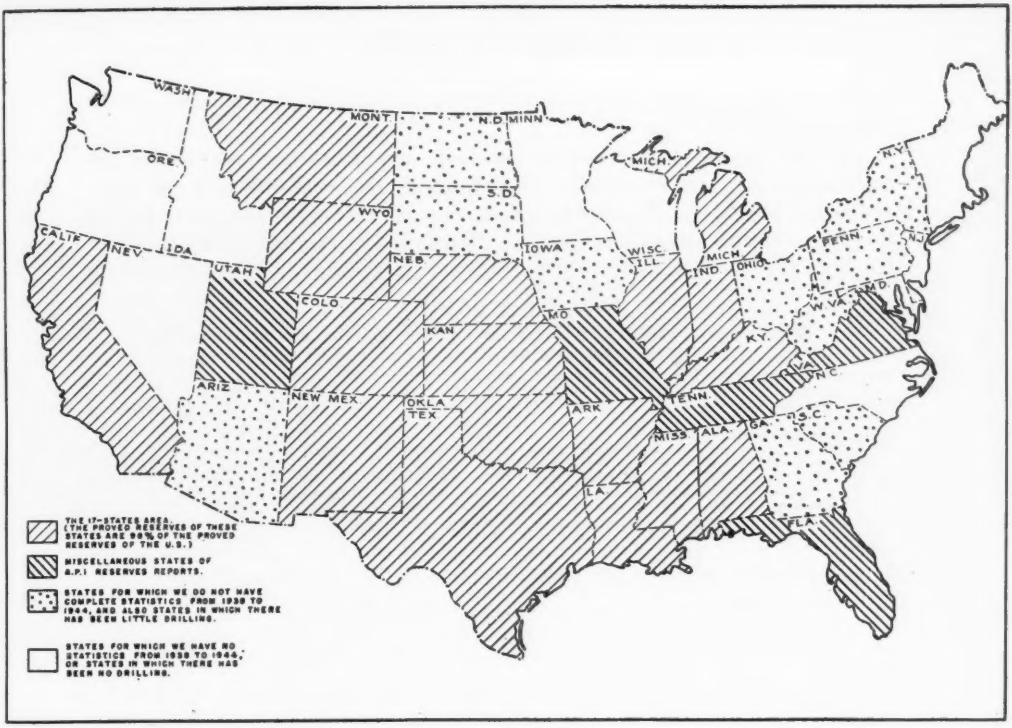


FIG. 3

TABLE V

DISTRIBUTION OF EXPLORATORY WELLS OF 1945 AND 1946 BY CLASSES AND RESULTS OF DRILLING

		17-States Area						*All States Reported*					
		1945			*1946*			*1945*			*1946*		
		Number	*Well Per Cent*	*Class Per Cent*	*Number*	*Well Per Cent*	*Class Per Cent*	*Number*	*Well Per Cent*	*Class Per Cent*	*Number*	*Well Per Cent*	*Class Per Cent*
Outposts	Producers	424	38.09		374	29.40		480	39.57		424	31.26	
	Dry holes	689	61.91		898	70.60		733	60.43		933	68.74	
	Totals	1,113	100.00	21.07	1,272	100.00	23.38	1,213	100.00	21.61	1,357	100.00	23.57
New-pool wildcats	Producers	207	25.30		233	29.95		236	26.14		271	31.88	
	Dry holes	611	74.70		545	70.05		767	73.86		579	68.12	
	Totals	818	100.00	15.49	778	100.00	14.30	903	100.00	16.09	850	100.00	14.77
Deeper-pool tests	Producers	106	26.56		80	21.56		114	27.08		85	21.73	
	Dry holes	293	73.44		291	78.44		307	72.92		306	78.27	
	Totals	399	100.00	7.55	371	100.00	6.81	421	100.00	7.50	391	100.00	6.79
Shallower-pool tests	Producers	32	82.06		21	80.77		33	82.50		24	82.75	
	Dry holes	7	17.94		5	19.23		7	17.50		5	17.25	
	Totals	39	100.00	.74	26	100.00	.50	40	100.00	.71	29	100.00	.53
New-field wildcats	Producers	335	11.50		313	10.45		351	11.37		333	10.65	
	Dry holes	2,578	88.50		2,680	89.55		2,685	88.63		2,792	89.35	
	Totals	2,913	100.90	55.15	2,993	100.00	55.01	3,036	100.00	54.09	3,125	100.00	54.34
Total producers		1,104	20.90		1,021			1,214	21.63		1,137		
Total dry holes		4,178	79.10		4,419			4,399	78.37		4,615		
Grand total		5,282	100.00	100.00	5,440	100.00	100.00	5,613	100.00	100.00	5,752	100.00	100.00

which is outpost drilling for long-distance extensions of pools already partly developed.

In 1946, in the 333 successful new-field wildcats throughout the United States, 1,692,977 feet were drilled, and 10,818,985 feet were drilled in the 2,792 dry new-field wildcats. Analogous figures, in 1945, were 1,789,392 feet drilled in the 351 successful new-field wildcats of that year, and 11,579,395 feet drilled in the 2,685 dry new-field wildcats. These figures indicate that, in new-field wildcats

TABLE VI

STATISTICS ON EXPLORATORY HOLES AND FOOTAGE DRILLED, AND ON AVERAGE DEPTH OF EXPLORATORY HOLE, IN 17-STATES AREA

	A		B	C	D	E	F	G	H	I	J	K
Year	*Successful Exploratory Wells*				*Number of Dry Exploratory Holes*	*Total Exploratory Holes (A+D)*	*Number of Dry Exploratory Holes Drilled for Each Producer (D/A)*	*Total Footage in Successful Exploratory Holes*	*Total Footage in Dry Exploratory Holes*	*Number of Feet Drilled in Dry Holes for Each Foot in Producers (H/G)*	*Total Exploratory Footage (G+H)*	*Average Depth of Exploratory Hole (J/E)*
	*Total Number of Producers**		*New-Field Discovery Wells*	*B is What Per Cent of A*								
1938	294 oil, 75 gas	369	226	61.2	2,264	2,633	6.13	1,526,557	7,303,609	4.78	8,830,166	3,354
1939	226 oil, 49 gas	275	175	63.6	2,396	2,671	8.71	1,118,420	7,610,632	6.80	8,729,052	3,268
1940	229 oil, 64 gas	363	238	65.5	2,618	2,981	7.21	1,419,875	8,635,624	6.08	10,055,499	3,373
1941	416 oil, 86 gas	502	281	55.9	2,716	3,218	5.41	2,045,769	9,488,962	4.63	11,534,731	3,584
1942	408 oil, 82 gas	490	263	53.6	2,690	3,180	5.48	2,155,522	9,894,844	4.59	12,050,366	3,789
1943	526 oil, 118 gas	644	288	44.7	3,144	3,788	4.88	2,714,855	12,235,454	4.51	14,950,309	3,947
1944	697 oil, 181 gas	878	330	37.6	3,672	4,550	4.18	4,190,732	15,228,020	3.63	19,418,752	4,268
1945	826 oil, 278 gas	1,104	335	30.3	4,178	5,282	3.78	5,150,145	16,803,881	3.56	21,963,026	4,007
1946	742 oil, 279 gas	1,021	313	30.7	4,419	5,440	4.33	4,915,572	16,247,991	3.31	21,163,563	3,890

* In this Column "gas" includes both gas wells and gas plus condensate wells.

TABLE VII

SUMMARY OF STATISTICS ON BASIS FOR LOCATING EXPLORATORY HOLES IN 17-STATES AREA

Year	*Geology*		*Geophysics*		*Geology and Geophysics*		*Sundry Non-Technical*		*Unknown*		*Totals*		*Grand Total*
	Prod.	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	
1938	192	1,039	78	251	31	67	44	535	24	372	369	2,264	2,633
1939	140	1,100	69	393	13	40	43	662	10	201	275	2,396	2,671
1940	195	1,195	100	443	22	79	35	770	11	131	363	2,618	2,981
1941	300	1,357	143	432	28	111	29	755	2	61	502	2,716	3,218
1942	305	1,418	110	484	42	134	22	575	11	79	490	2,690	3,180
1943	405	1,813	147	538	65	242	21	480	6	71	644	3,144	3,788
1944	568	2,014	145	643	102	263	58	672	5	80	878	3,672	4,550
1945	771	2,733	142	543	140	313	29	353	22	236	1,104	4,178	5,282
1946	691	2,982	142	459	158	311	16	452	14	215	1,021	4,419	5,440

TABLE VIII

SUMMARY OF STATISTICS ON PROVED OIL RESERVES AND EXPLORATORY DRILLING IN 17-STATES AREA (SEE FIG. 3)*

Year	A *Proved Oil Reserves as of Jan. 1 (1,000's of Bbls.)*	B *Proved Oil Reserves as of Dec. 31** (1,000's of Bbls.)*	C *Net New Proved Oil Reserves (1,000's of (Bbls.)*	D *Oil Production During Year (1,000's of Bbls.)*	E *Gross New Proved Oil Reserves (C+D) (1,000's of Bbls.)*	F *Total Exploratory Footage (Feet)*	G *New Proved Oil Reserves (E) Per Explor-atory Foot Drilled (Bbls.) E/F*	H *Total Num-ber of Explor-atory Holes Drilled*	I *New Proved Oil Reserves (E) Per Exploratory Hole Drilled (Bbls.) E/H*
1938	15,102,239	17,056,370	1,954,131	1,183,733	3,137,864	8,830,166	355.3	2,633	1,191,744
1939	17,056,370	18,186,767	1,130,397	1,235,013	2,365,410	8,729,052	270.9	2,671	885,589
1940	18,186,767	18,688,777	502,010	1,322,794	1,824,804	10,055,499	181.5	2,981	612,161
1941	18,688,777	19,270,869	582,092	1,375,411	1,957,503	11,534,731	169.7	3,218	608,298
1942	19,270,869	19,792,818	521,949	1,355,102	1,877,051	12,050,366	155.7	3,180	590,267
1943	19,792,818	19,759,516	−33,302	1,475,881	1,442,579	14,950,309	96.5	3,788	380,828
1944	19,759,516	20,171,588	412,072	1,653,453	2,065,525	19,418,752	106.0	4,550	453,961
1945	20,171,588	20,566,405	394,817	1,713,725	2,108,542	21,963,026	96.0	5,282	399,194
1946	20,566,405	21,682,344	1,115,939	1,701,952	2,817,891	21,163,563	133.1	5,440	517,994

* The proved oil reserves shown in this table are all comparable in the sense that they include crude oil and cycle plant condensate with some lease condensate. This statement applies to 1946 where figures analogous to those preceding have been used, although the Report of the American Petroleum Institute for December 31, 1946, has been prepared on a different basis.

** This figure happens to be between 98 and 99 per cent of the total proved oil reserves of the United States as of the same date (December 31) each year.

in the country as a whole, the average depth was 4,403 feet in 1945 and 4,004 feet in 1946.

In Tables VI and VII are listed comparative data for the 17-states area, many of them similar to those presented for the United States in Tables II and IV, but in Tables VI and VII only annual totals are given. Details by states can be obtained from the earlier reports.

We wish to call particular attention to columns A, B, and C, in Table VI. Here we show that, although, since 1940 (with the exception of 1942 and 1946), there has been an increasing number of successful exploratory holes, nevertheless in that same period the percentage of new-field discoveries has decreased, with a slight improvement in1946. In 1945 and 1946 this percentage was less than half what it was in 1940. Significant also is the fact that, from 1939 to 1946, there has been apparent a general improvement in the producer-dry-hole ratio from 8.71 dry holes per producer to 4.33[6] dry holes per producer, and from 6.80 feet drilled in dry holes per foot in producers to 3.31 feet drilled in dry holes per foot in producers. In other words exploratory drilling has been increasingly successful in finding new oil and gas—we are not referring here to *quanity* of new oil and gas—in outpost drilling and in new-pool drilling, but it has been decreasingly successful in finding new oil and gas in new-field ("rank wildcat") drilling.

In Table VIII are listed annual statistics comparing the American Petroleum Institute's figures on proved oil reserves[7] with our figures on exploratory drilling.

[6] In 1944 and 1945 this ratio was better than in 1946; that is, 4.18 and 3.78, respectively.

[7] We have taken totals of the reserves figures published by the A.P.I. each year for the 17 states. For December 31, 1946, we have used reserves figures analogous to those used in the earlier years.

This comparison is suggestive, but it is not quite precise, and for this reason: the estimated "new proved reserves" (columns C and E) include, for each year, newly discovered proved reserves and also new proved reserves resulting from extensions of pools or fields previously discovered.[8] This new oil by extensions is very largely a result of regular field development, not of exploratory drilling. In fact, some study of this matter leads us to conclude that probably not more than 2 per cent—certainly not more than 5 per cent—of the new proved reserves added by extensions in any given year is attributable to exploratory drilling. It is nearly all to be credited to field-development drilling. However, this "extension oil," each year, is really a follow-up of the discoveries of several preceding years. In this sense certain fractions of it might be credited to years gone by, but this would involve many serious difficulties. We believe that it is better to refer to the simpler picture as presented in Table VIII, keeping in mind that columns G and I do not actually measure the results of the exploratory effort for any given year. If a somewhat closer analysis is sought, an approach to the problem can be made similar to that illustrated in Table V, on page 1589 of our "Review."[9]

As indicated in Table I, a hole may be located as an outpost with the intention of trying to extend a pool partly developed, but instead it may discover a new pool; and, similarly, a new-pool wildcat may be located in search of a new pool because it is believed to be well outside the limits of the known pool, but instead it may result in extending this known pool farther than had been expected. A majority of outposts, if successful, are completed as extension wells and a majority of new-pool wildcats, if successful, discover new pools. To show the class distribution of these completions in 1946, we prepared Table IX. Here we see that 371 outposts were completed as extension wells and 53 were completed as new-pool discoveries; and 183 new-pool wildcats discovered new pools whereas 88 new-pool wildcats were completed as extension wells. It is further interesting to note, referring to both Tables V and IX, that in the 17-states area, in 1946, 313 new fields and 303 new pools were discovered, as compared with 405 extensions, and that in the entire country there were 333 new-field discoveries and 345 new-pool discoveries, compared with 459 extensions.[10]

A question sometimes asked concerns the approximate percentage of true wildcatting (new-field wildcatting) by major companies, on the one hand, and by minor companies and independents, on the other hand. Distinction between these three classes of operator is not always easy, and in some instances the same company may be regarded as a "major" in one district, but as a "minor" in another district. Consequently we left the classification to the judgment of the various

[8] We need not concern ourselves here with revisions due to correction of factors used in making the reserves estimates.

[9] "Review of Exploratory Drilling Statistics," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 11 (November, 1945), pp. 1581–92.

[10] The new-pool discoveries referred to in this paper are all the result of exploratory drilling. In addition to these, at least 114 new pools were discovered in the drilling of field-development wells. These included 12 discoveries of gas, 59 of oil, and 6 of condensate.

committeemen, each for his own district. Usually a major company is defined as one which is integrated with respect to at least three of the four main branches of production, transportation, refining, and marketing.

Our statistics showed that in the country as a whole, 659 new-field wildcats (118 producers and 541 dry holes)were drilled by majors; 1,991 new-field wildcats (161 producers and 1,830 dry holes) were drilled by minors and independents; and 475 new-field wildcats (54 producers and 421 dry holes) were drilled by minors or independents with the drilling financed by major companies. Corresponding figures for the 17-states area were 618 new-field wildcats (113 producers and 505 dry holes) by majors; 1,904 new-field wildcats (147 producers and 1,757

TABLE IX

NEW-POOL DISCOVERIES AND EXTENSIONS OF OLDER POOLS IN 1946

		New Pools Discovered				*Total New Pools Discovered in 1946*	*Extension of Old Pools*		*Total Extensions*
		By Out-posts	*By New-Pool Wildcats*	*By Deeper-Pool Tests*	*By Shallower-Pool Tests*		*By Out-posts*	*By New-Pool Wildcats*	
A 17-States area	Oil	20	118	52	16	206	231	70	301
	Gas	14	29	13	4	60	78	5	83
	Condensate	13	8	15	1	37	18	3	21
B Remaining states	Oil	1	5	0	1	7	8	4	12
	Gas	5	22	5	2	34	27	3	30
	Condensate	0	1	0	0	1	9	3	12
C Total U. S. (A+B)	Oil	21	123	52	17	213	239	74	313
	Gas	19	51	18	6	94	105	8	113
	Condensate	13	9	15	1	38	27	6	33
Grand total (Oil+gas+condensate)		53	183	85	24	345	371	88	459

dry holes) by minors and independents; and 471 new-field wildcats (53 producers and 418 dry holes) by minors and independents with the drilling financed by majors.

In our "Review of Exploratory Drilling Statistics," already cited, on pages 1590 and 1591, and in Table VI of that article, we compared estimates of total ultimate reserves of the fields discovered in the 17-states area in the years 1938 to 1943 inclusive, these *estimates* being made, not at the time of discovery, but all of them as of January 1, 1945. Since the fields in 1943 were the latest considered in that study, all of them had at least a year of development history on January 1, 1945, to help toward a reasonably fair estimate. The older fields had a correspondingly longer period of development history to serve as a guide. In making the estimates the reserves of pools subsequently discovered on a producing structure were all added to the reserves of the first pool discovered on that structure, and the total of these pool reserves was assigned to the year of discovery of the first pool. No fields were included in the study except those of which the first pool was discovered within the 6-year period (1938 to 1943).

In accordance with our suggestion made in the "Review," our committee has made a re-appraisal of the fields discovered in those six years in the 17-states area, and has added estimates of the total ultimate reserves for the new-field discoveries of 1944 and 1945 in the same area. Table X presents these estimates which were made as of January 1, 1947. As a result of the re-appraisal several fields were dropped from the list either because they were gas fields or because they were abandoned. We are now classifying as "F" those fields which have been abandoned. In the re-appraisal of January 1, 1947, 2 A-fields were lowered to B (that is, the total ultimate reserves estimated as more than 50 million barrels a year ago are now placed between 25 and 50 million barrels); 3 B-fields were raised to A; 2 B-fields were lowered; 5 C-fields were raised; 7 C-fields were lowered; 16 D-fields

TABLE X

NUMBER OF FIELDS DISCOVERED EACH YEAR IN 17-STATES AREA, GROUPED ACCORDING TO ESTIMATED TOTAL ULTIMATE RESERVES

Year of Discovery	*Reserves Group**						*Total A-F, Incl.*	*Percentage of A+B+C Fields in Total Fields*
	A	*B*	*C*	*D*	*E*	*F*		
	Number of Fields Discovered in Year Indicated							
1938	10	9	20	56	103	25	223	17.48
1939	5	1	15	51	76	18	166	12.65
1940	4	10	18	54	120	14	220	13.97
1941	4	3	12	61	168	23	271	7.01
1942	1	3	10	53	165	24	256	5.46
1943	1	2	13	56	194	13	279	5.73
1944	4	0	9	49	174	9	245	5.30
1945	1	1	3	29	174	5	213	2.34

* In these estimates of total ultimate reserves, made as of December 31, 1946 (January 1, 1947),
A: 50 million or more barrels.
B: between 25 million and 50 million barrels.
C: between 10 million and 25 million barrels.
D: between 1 million and 10 million barrels.
E: less than 1 million barrels.
F: abandoned.

were raised; 29 D-fields were lowered; 36 E-fields were raised; and 94 E-fields were reported abandoned, and therefore were lowered to F. Among all the 1,669 discoveries made in the 7-year period (1938 to 1947 inclusive), the estimates were raised in 60 cases and lowered in 134 cases, but note that a large majority of the estimates lowered were actual abandonments. If we add together the A-fields, B-fields, and C-fields for each year, that is, all fields having total ultimate reserves of 10 million barrels or more, and find the percentage of these totals in the whole group of fields (A to E inclusive) for each year, we observe a regularly decreasing percentage (see last column in Table X). There is no doubt that the percentages recorded for 1945 and probably for 1944 and 1943 will increase somewhat by future raising of some D estimates into the C group, but these changes will probably not be more than a point or two. As the years go by, we geologists should especially watch the trend from 1938 forward to the year 3 or 4 years previous to the year of writing each annual report of this committee.

Again, as last year, we wish to say that the committee will welcome any suggestions for improvement of its annual reports in future years.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 31, NO. 6 (JUNE, 1947), PP. 931-946, 4 FIGS.

DEVELOPMENTS IN CALIFORNIA IN 1946[1]

GRAHAM B. MOODY[2]

ABSTRACT

Exploratory activity in 1946 subsided somewhat from the record level of 1945 but was still substantially ahead of 1944. Three hundred sixty-six exploratory wells were completed in 1946, a total exploratory distance of 1,584,647 feet or 300 miles. The total number of completions, total footage, and percentage of success for the different types of exploratory wells were as follows: new-field wildcats—211 wells, 950,855 feet, wells 8.5 per cent successful, footage 11.1 per cent successful; new-pool wildcats—47 wells, 230,720 feet, wells 27.7 per cent successful, footage 26.8 per cent successful; deeper-pool tests—29 wells, 78,695 feet, wells 10.3 per cent successful, footage 6.8 per cent successful; shallower-pool tests—4 wells, 19,585 feet, wells 75.0 per cent successful, footage 78.3 per cent successful; outposts—75 wells, 304,792 feet, wells 44.0 per cent successful, footage 38.6 per cent successful. All exploratory wells were 19.1 per cent successful as to number and 19.4 per cent successful as to footage; the analogous figures for 1945 were 21.0 per cent successful as to number of wells and 17.5 per cent successful as to footage. Thirty oil pools and fields and 7 gas pools and fields were discovered in 1946. Subsurface geology again played a major role in locating the wells that made discoveries. New pools, new fields, and successful outpost wells added about 132,000,000 barrels to oil reserves and about 110,000,000 MCF to dry gas-field gas reserves. None of the new pools or fields can be rated yet as a major discovery. Production in 1946 was approximately 317,500,000 barrels (including condensate) and 528,000,000 MCF of gas. There were 57 active exploratory wells at the close of 1946.

INTRODUCTION

This article follows the general method of presentation used by the writer in two previous discussions[3] covering activities in California during 1944 and 1945. The classification of exploratory wells described by F. H. Lahee[4] is followed. The process of classification has been facilitated and standardized by the assistance of a committee that functioned efficiently during 1946. The writer's periodic consultations with the able members of thic committee eliminated the factor of possible personal bias from the classification of exploratory ventures. The members of this committee are:[5] F. B. Carter, T. J. Fitzgerald, H. W. Lee, H. E. Rader, R. L. Rist, A. J. Solari, and the writer as chairman. This report on 1946 California developments represents the efforts of the committee.

An attempt is made to condense the written matter as much as possible because of the continued scarcity of paper. This procedure is in line with the writer's opinion that statistical material on exploration is most efficiently presented by means of maps, tabulations, figures, and minimum verbiage.

[1] Manuscript received, March 27, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Standard Oil Company of California. The writer expresses his thanks and appreciation to M. E. Bigelow and A. Brennan for assistance in the compilation of the tables and in the construction of the figures, and to D. J. Christensen, A. A. Hagan, and J. H. Harvey for preparing the figures for publication.

[3] *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), p. 646, and Vol. 30, No. 6 (June, 1946), p. 829.

[4] Frederic H. Lahee, "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), p. 630.

[5] W. S. Knouse served for a short time but resigned when transferred from California.

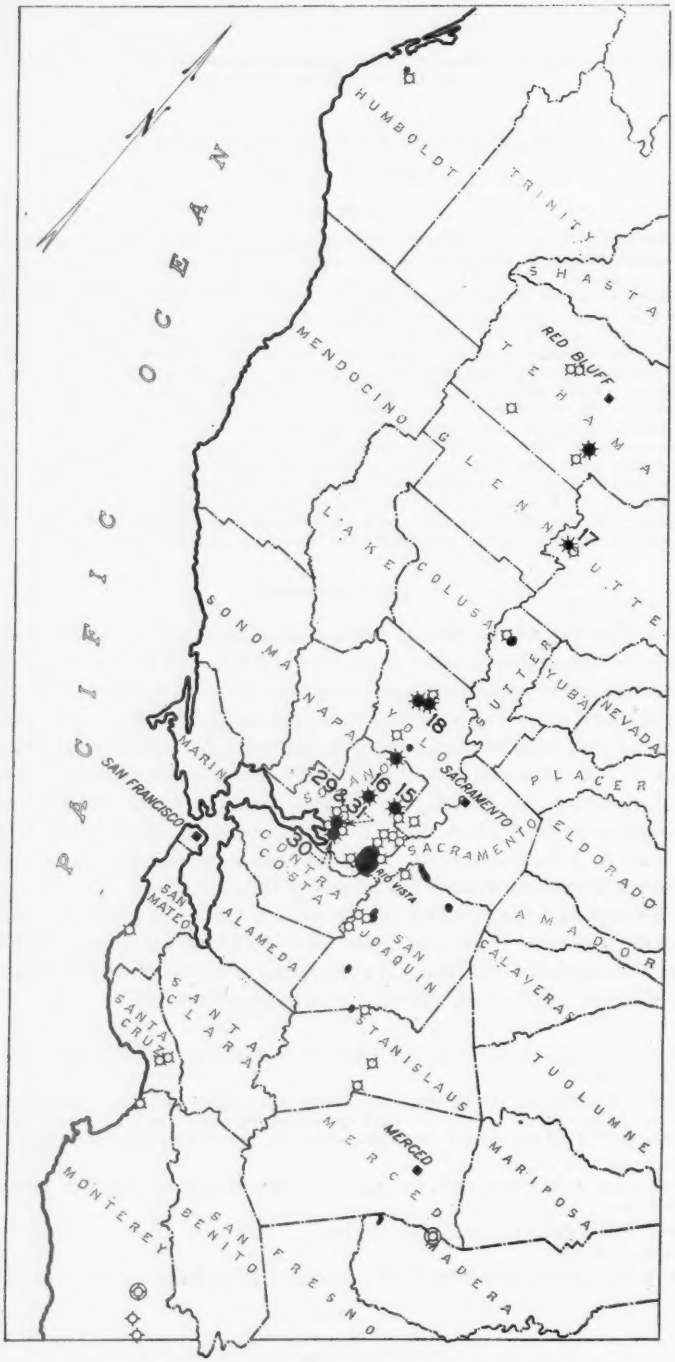


FIG. 1.—Locations of 1946 exploratory wells in north half of California. See Figure 2-A for explanation of symbols.

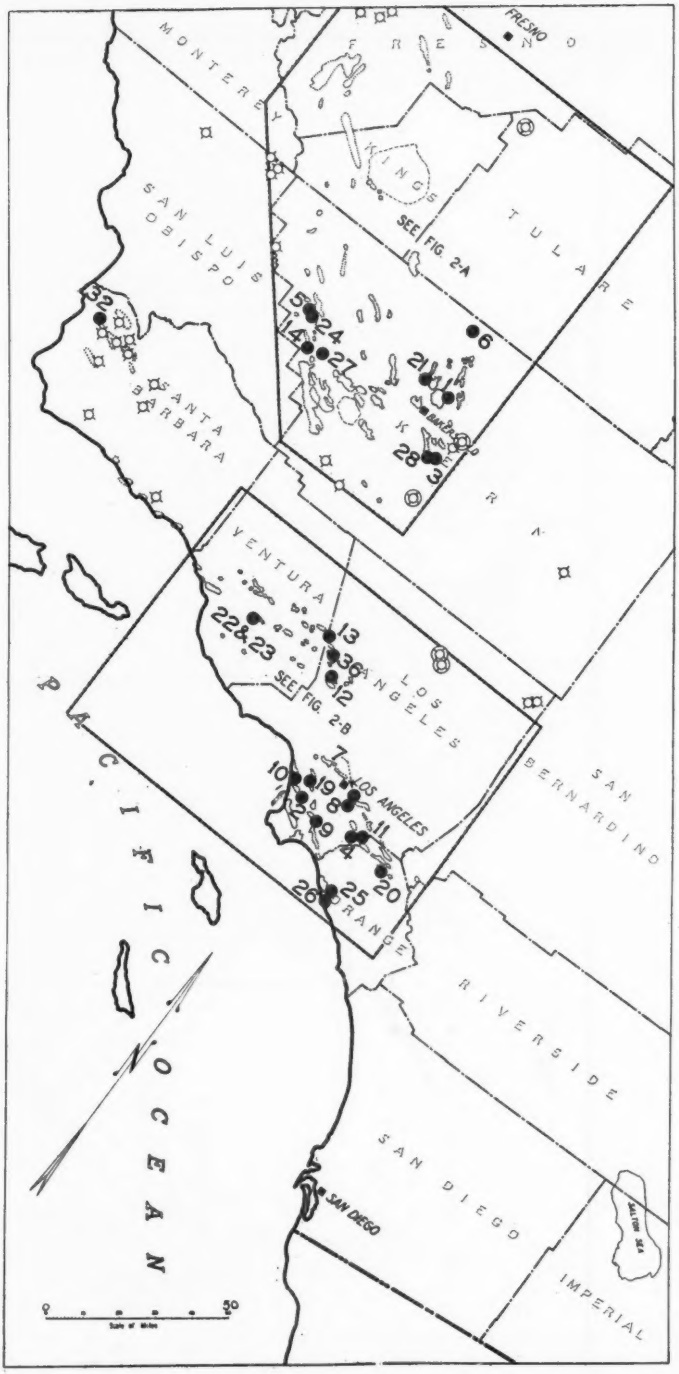
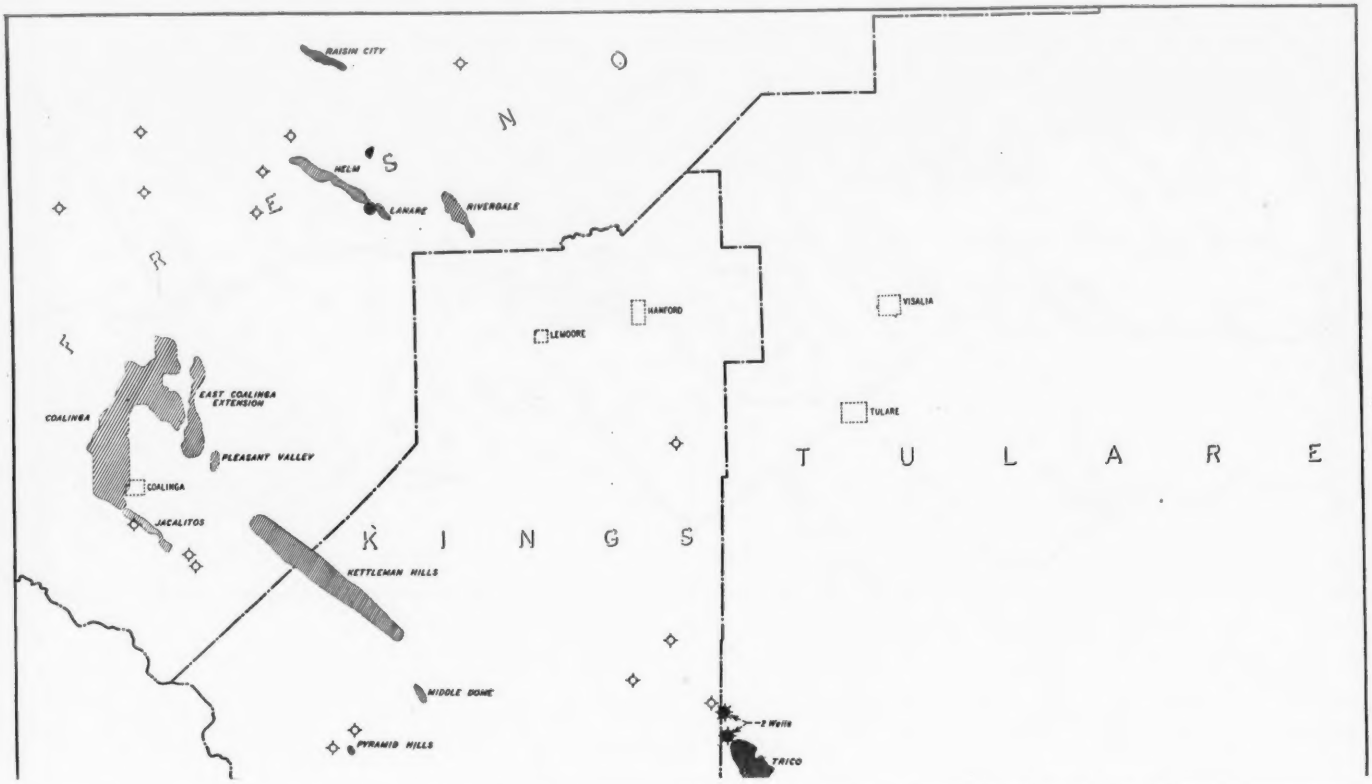


FIG. 2.—Locations of 1946 exploratory wells in south half of California. See Figure 2-A for explanation of symbols.


RAISIN CITY
HELM
LANARE
RIVERDALE
FRESNO
HANFORD
LEMOORE
VISALIA
TULARE
COALINGA
EAST COALINGA EXTENSION
PLEASANT VALLEY
COALINGA
JACALITOS
KINGS
TULARE
KETTLEMAN HILLS
MIDDLE DOME
PYRAMID HILLS
2 Wells
TRICO

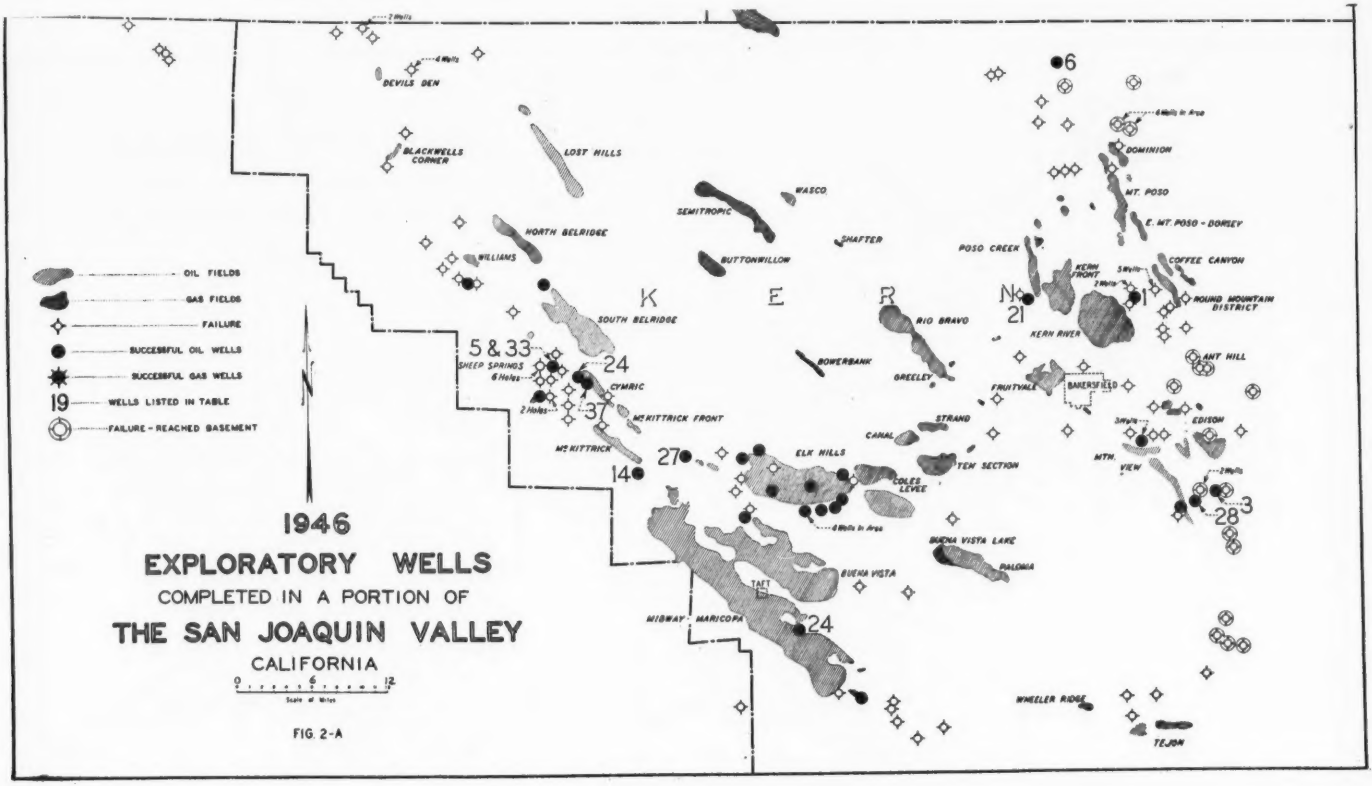

OIL FIELDS
GAS FIELDS
FAILURE
SUCCESSFUL OIL WELLS
SUCCESSFUL GAS WELLS
19 WELLS LISTED IN TABLE
FAILURE - REACHED BASEMENT
1946
EXPLORATORY WELLS
COMPLETED IN A PORTION OF
THE SAN JOAQUIN VALLEY
CALIFORNIA
Scale of Miles
DEVILS DEN
BLACKWELLS CORNER
LOST HILLS
WASCO
SEMITROPIC
SHAFTER
NORTH BELRIDGE
WILLIAMS
BUTTONWILLOW
SOUTH BELRIDGE
5 & 33
SHEEP SPRINGS
6 Holes
24
CYMRIC
2 Holes
31
McKITTRICK FRONT
McKITTRICK
14
27
ELK HILLS
COLES LEVEE
TEN SECTION
CANAL
STRAND
RIO BRAVO
BOWERBANK
GREELEY
POSO CREEK
KERN FRONT
KERN RIVER
FRUITVALE
BAKERSFIELD
DOMINION
MT. POSO
E. MT. POSO - DORSEY
COFFEE CANYON
ROUND MOUNTAIN DISTRICT
ANT HILL
EDISON
MTN. VIEW
28
3
BUENA VISTA LAKE
BUENA VISTA
TAFT
MIDWAY - MARICOPA
24
WHEELER RIDGE
TEJON
6
21
1

FIG. 2-A

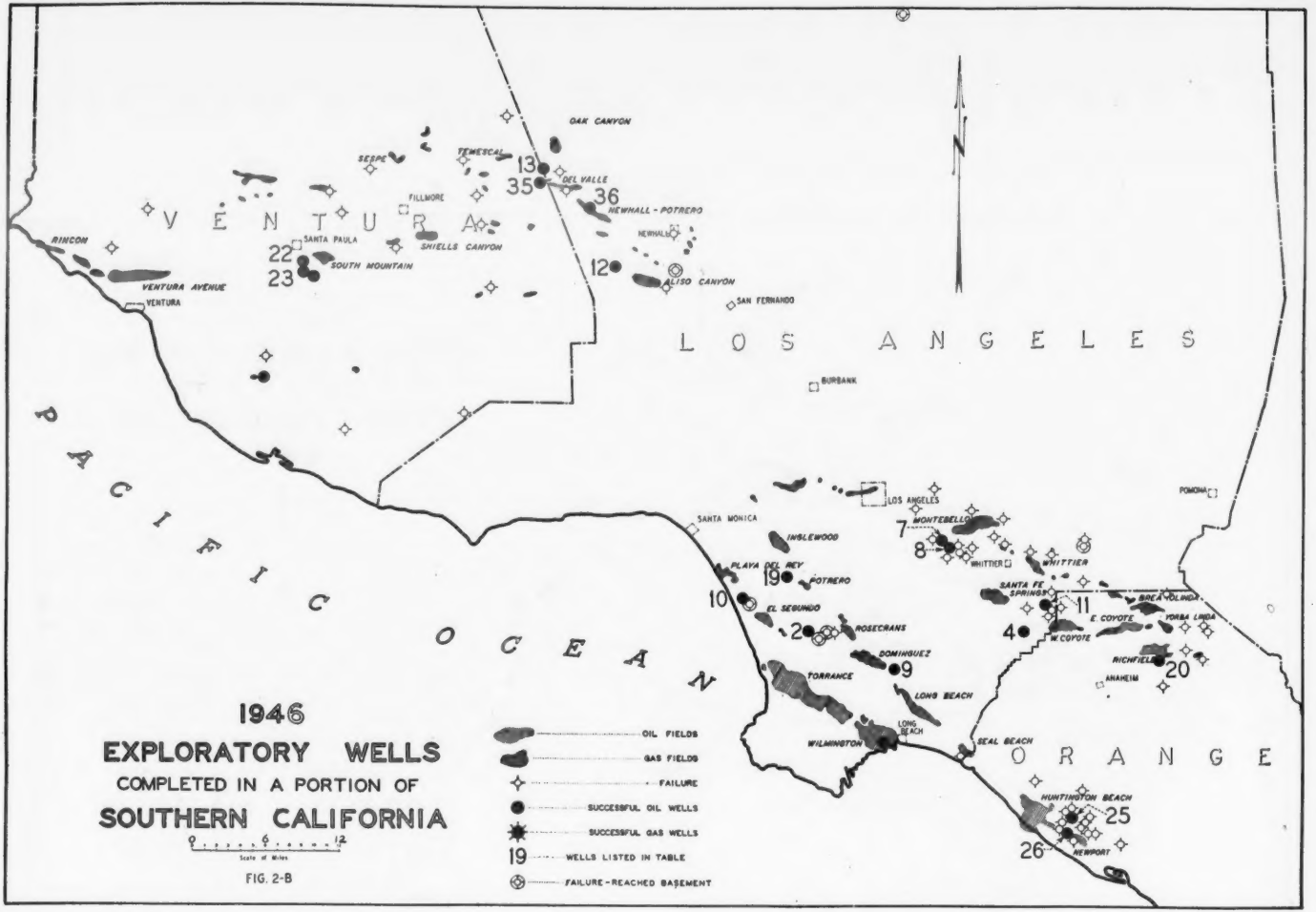

OAK CANYON
SESPE
TEMESCAL
13
35
DEL VALLE
36
NEWHALL - POTRERO
FILLMORE
VENTURA
NEWHALL
RINCON
SANTA PAULA
22
23
SOUTH MOUNTAIN
SHIELLS CANYON
12
LISO CANYON
VENTURA AVENUE
VENTURA
SAN FERNANDO
LOS ANGELES
BURBANK
PACIFIC OCEAN
SANTA MONICA
LOS ANGELES
POMONA
INGLEWOOD
7
MONTEBELLO
8
WHITTIER
PLAYA DEL REY
19
POTRERO
10
EL SEGUNDO
2
ROSECRANS
SANTA FE SPRINGS
11
BREA-OLINDA
E. COYOTE
YORBA LINDA
4
W. COYOTE
DOMINGUEZ
9
RICHFIELD
20
ANAHEIM
TORRANCE
LONG BEACH
WILMINGTON
LONG BEACH
SEAL BEACH
ORANGE
HUNTINGTON BEACH
25
26
NEWPORT
1946
EXPLORATORY WELLS
COMPLETED IN A PORTION OF
SOUTHERN CALIFORNIA
0 3 6 9 12
Scale of Miles
OIL FIELDS
GAS FIELDS
FAILURE
SUCCESSFUL OIL WELLS
SUCCESSFUL GAS WELLS
19 WELLS LISTED IN TABLE
FAILURE-REACHED BASEMENT

FIG. 2-B

EXPLORATION

The locations of exploratory wells relative to previously producing areas are shown in Figures 1, 2, 2-A, and 2-B. The last 2 are enlargements of the most active areas of Figure 2. The large numbers attached to successful wells are for reference to Tables IV, V, and VI.

The numbers of wells, amounts of footage, and success percentages of the 5 types of exploratory wells, subdivided into gas-exploratory and oil-exploratory, are given in Table I. Exploratory effort was 11 per cent lower in respect both to number of wells and footage than in 1945 but was 14 per cent and 9 per cent higher as to number of wells and footage, respectively, than in 1944.

The success factor for number of wells decreased to 19.1 per cent from the 20.0 per cent of 1945 whereas for footage it increased to 19.4 per cent from the 17.5 per cent of 1945. New-field wildcats, the exploratory wells carrying the greatest risk, increased their success factors to 8.5 per cent as to number of wells and 11.1 per cent as to footage from 5.0 per cent and 4.2 per cent, respectively, in 1945.

The 5 counties with almost 80 per cent of total exploratory effort were the following.

County	*Number of Exploratory Wells*	*Success Percentage*
Kern	171	20
Los Angeles	51	24
Orange	25	12
Ventura	22	23
Solano (all were gas-exploratory)	18	28

The names, locations, and depths of the 46 unsuccessful exploratory wells that reached basement are given in Table VII. Each of these dry holes is differentiated on Figures 1, 2, 2-A, and 2-B by an extra circle around the symbol indicating a failure.

There were 12 seismograph and 2 gravimeter parties active at the close of 1946. Comparable figures at the end of 1945 were 14 and 1, respectively.

The relative importance and success of geological, geophysical, and other methods in locating the exploratory holes are given in Tables II and III; the former treats number of wells and the latter footage. Tables II-A and III-A are recapitulations to show the accomplishments of the most important methods by themselves and their total accomplishments through their own efforts and through collaboration with other methods. These recapitulations compare figures for total exploratory holes and for wildcats, both new-field and new-pool.

Subsurface geology again was the dominant factor in locating 1946 drilling ventures. It was entirely responsible for 37 per cent of all exploratory locations and for 30 per cent of wildcat locations. Its total contributory effort amounted to 74 per cent for all types of exploratory wells and 68 per cent for wildcats only. Its success in those ventures for which it had sole responsibility was 20 per cent for all exploratory wells and 13 per cent for wildcats. Geophysics had less participation in exploratory effort but scored 23 per cent and 16 per cent success for all

TABLE I

SUMMARY

EXPLORATORY WELL COMPLETIONS BY ALL OPERATORS

CALIFORNIA—1946

	Number of Wells Completed			Exploratory Footage					
				Total Footage			Average Per Well		
							Successful Wells		
	All Wells	Successful Wells	Success Percentage	All Wells	Successful Wells		All Wells	Successful Footage Only	Total Exploratory Footage Drilled
					Amount[a]	Percentage			
NEW FIELD WILDCATS									
Drilled primarily to find oil	184	14[m]	7.6	824,358	91,103[a]	11.1	4,480	6,507	7,186
Drilled primarily to find gas	27	4	14.8	126,497	14,841[b]	11.7	4,685	3,710	5,138
Totals	211	18	8.5	950,855	105,944[c]	11.1	4,506	5,886	6,675
NEW POOL WILDCATS									
Drilled primarily to find oil	42	10[n]	23.8	207,328	54,293[d]	26.2	4,936	5,429	5,738
Drilled primarily to find gas	5	3	60.0	23,392	7,551[e]	32.3	4,678	2,517	3,695
Totals	47	13	27.7	230,720	61,844[f]	26.8	4,909	4,757	5,266
DEEPER POOL TESTS									
Drilled primarily to find oil	25	3	12.0	69,948	5,368[g]	7.7	2,798	1,789	2,173
Drilled primarily to find gas	4	—	—	8,747	—	—	2,187	—	—
Totals	29	3	10.3	78,695[h]	5,368[g]	6.8	2,714	1,789	2,173
SHALLOWER POOL TESTS									
Drilled primarily to find oil	4	3	75.0	19,585	15,335	78.3	4,896	5,112	5,112
Drilled primarily to find gas	—	—	—	—	—	—	—	—	—
Totals	4	3	75.0	19,585	15,335	78.3	4,896	5,112	5,112
OUTPOSTS									
Drilled primarily to find oil	63	26[p]	41.3	265,268	98,286[i]	37.1	4,211	3,780	3,869
Drilled primarily to find gas	12	7[p]	58.3	39,524	20,051[j]	50.7	3,294	2,864	3,123
Totals	75	33	44.0	304,792	118,337[k]	38.8	4,064	3,585	3,710
TOTALS OF ALL EXPLORATORY WELLS									
Drilled primarily to find oil	318	56	17.6	1,386,487	264,385	19.1	4,360	4,721	4,990
Drilled primarily to find gas	48	14	29.2	198,160	42,443	21.4	4,128	3,032	3,821
Grand totals	366	70	19.1	1,584,647	306,828[l]	19.4	4,330	4,383	4,756

[a] Drilled an additional 8,502 feet of dry exploratory hole.
[b] Drilled an additional 5,709 feet of dry exploratory hole.
[c] Drilled an additional 14,211 feet of dry exploratory hole.
[d] Drilled an additional 3,082 feet of dry exploratory hole.
[e] Drilled an additional 3,533 feet of dry exploratory hole.
[f] Drilled an additional 6,615 feet of dry exploratory hole.
[g] Drilled an additional 1,150 feet of dry exploratory hole and 7,600 feet of non-exploratory hole to pass previously productive pools.
[h] All deeper pool tests drilled an additional 93,109 feet of non-exploratory hole to pass depths of previously productive pools.
[i] Drilled an additional 2,296 feet of dry exploratory hole.
[j] Drilled an additional 1,809 feet of dry exploratory hole.
[k] Drilled an additional 4,105 feet of dry exploratory hole.
[l] All successful exploratory wells drilled an additional 26,081 feet of dry exploratory hole.
[m] One of these wells started as a new field wildcat but finished as a new pool discovery.
[n] Three of these wells started as new pool wildcats but finished as successful extensions to old pools.
[p] One of these wells started as an outpost but finished as a new pool discovery.
[s] This is net discovery or net successful exploratory footage.

exploratory wells and for wildcats, respectively, in those ventures for which it had sole responsibility. Note, however, that in respect to footage involved subsurface geology was more successful than geophysics in independent ventures;

TABLE II

Exploratory Wells Allocated to Type of Well and to Basis for Locating Well

	New Field and New Pool Wildcats			*Deeper and Shallower Pool Tests*			*Outposts*			*Totals*		
	Total Wells	*Successful Wells*		*Total Wells*	*Successful Wells*		*Total Wells*	*Successful Wells*		*Total Wells*	*Successful Wells*	
		Number	*% of Total*		*Number*	*% of Total*		*Number*	*% of Total*		*Number*	*% of Total*
Surface geology	18	1	5.6	—	—	—	2	—	—	20	1	5.0
Surface geology and trend	2	1	50.0	—	—	—	—	—	—	2	1	50.0
Surface geology and core drilling	2	—	—	—	—	—	—	—	—	2	—	—
Surface and subsurface geology and core drilling	2	—	—	—	—	—	—	—	—	2	—	—
Surface and subsurface geology and trend	—	—	—	1	—	—	—	—	—	1	—	—
Surface geology and seismic and trend	1	—	—	—	—	—	—	—	—	1	—	—
Surface and subsurface geology and seismic	4	1	25.0	—	—	—	—	—	—	4	1	25.0
Surface and subsurface geology	44	6	13.6	2	—	—	19	13	68.4	65	19	29.2
Subsurface geology	78	10	12.8	27	6	22.2	31	11	35.5	136	27	19.9
Subsurface geology and trend	5	2	40.0	—	—	—	10	5	50.0	15	7	46.7
Subsurface geology and core drilling	—	—	—	1	—	—	—	—	—	1	—	—
Subsurface geology and core drilling and seismic	1	—	—	—	—	—	—	—	—	1	—	—
Subsurface geology and seismic and gravity	1	1	100.0	—	—	—	—	—	—	1	1	100.0
Subsurface geology and seismic and trend	—	—	—	—	—	—	1	—	—	1	—	—
Subsurface geology and gravity	1	1	100.0	—	—	—	—	—	—	1	1	100.0
Subsurface geology and seismic	38	5	13.2	1	—	—	2	—	—	41	5	12.2
Seismic	19	3	15.8	1	—	—	2	2	100.0	22	5	22.7
Trend	2	—	—	—	—	—	3	—	—	5	—	—
Geochemical	2	—	—	—	—	—	—	—	—	2	—	—
Non-technical	28	—	—	—	—	—	1	1	100.0	29	1	3.4
Unknown	10	—	—	—	—	—	4	1	25.0	14	1	7.1
Totals	258	31	12.0	33	6	18.2	75	33	44.0	366	70	19.1

TABLE II-A

Recapitulation of Table II

Number of Wells

	All Exploratory Wells			*New Field and New Pool Wildcats Only*		
	Number	*% of Total*	*Success %*	*Number*	*% of Total*	*Success %*
SURFACE GEOLOGY						
By itself	20	6	5	18	7	6
Wherever involved	97	27	22	44	17	20
SUBSURFACE GEOLOGY						
By itself	136	37	20	78	30	13
Wherever involved	269	74	23	175	68	15
GEOLOGY—TOTAL						
By itself	249	68	22	153	60	13
Wherever involved*	299	82	21	199	77	14
GEOPHYSICS—TOTAL						
By itself	22	6	23	19	7	16
Wherever involved	72	20	18	65	25	17
GEOCHEMICAL, NON-TECHNICAL AND UNKNOWN	45	12	4	40	16	—

* Gravity surveys involved in two of these.

TABLE III

EXPLORATORY FOOTAGE ALLOCATED TO TYPES OF WELL AND TO BASIS FOR LOCATING WELL

	New Field and New Pool Wildcats			*Deeper and Shallower Pool Tests*			*Outposts*			*Total*		
	Total Footage	*Successful Footage*		*Total Footage*	*Successful Footage*		*Total Footage*	*Successful Footage*		*Total Footage*	*Successful Footage*	
		Amount	*% of Total*		*Amount*	*% of Total*		*Amount*	*% of Total*		*Amount*	*% of Total*
Surface geology	66,246	2,988	4.5	—	—	—	5,155	—	—	71,401	2,988	4.2
Surface geology and trend	5,403	2,108	39.0	—	—	—	—	—	—	5,403	2,108	39.0
Surface geology and core drilling	5,367	—	—	—	—	—	—	—	—	5,367	—	—
Surface and subsurface geology and core drilling	1,600	—	—	—	—	—	—	—	—	1,600	—	—
Surface and subsurface geology and trend	—	—	—	1,263	—	—	—	—	—	1,263	—	—
Surface geology and seismic and trend	11,132	—	—	—	—	—	—	—	—	11,132	—	—
Surface and subsurface geology and seismic	32,087	7,660	23.9	—	—	—	—	—	—	32,087	7,660	23.9
Surface and subsurface geology	184,055	33,587	18.2	14,072	—	—	94,601	51,881	54.8	292,728	85,468	29.2
Subsurface geology	311,586	44,657	14.3	75,426	20,703	27.4	129,951	44,046	33.9	516,963	109,406	21.2
Subsurface geology and trend	18,231	6,305	34.6	—	—	—	31,925	12,182	38.2	50,156	18,487	36.9
Subsurface geology and core drilling	—	—	—	2,935	—	—	—	—	—	2,935	—	—
Subsurface geology and core drilling and seismic	5,545	—	—	—	—	—	—	—	—	5,545	—	—
Subsurface geology and seismic and gravity	7,033	6,940	98.7	—	—	—	—	—	—	7,033	6,940	98.7
Subsurface geology and seismic and trend	—	—	—	—	—	—	2,800	—	—	2,800	—	—
Subsurface geology and gravity	9,154	9,154	100.0	—	—	—	—	—	—	9,154	9,154	100.0
Subsurface geology and seismic	264,214	39,548	15.0	662	—	—	15,936	—	—	280,812	39,548	14.1
Seismic	131,275	14,841	11.3	3,922	—	—	6,955	6,617	95.1	142,152	21,458	15.1
Trend	8,785	—	—	—	—	—	6,416	—	—	15,201	—	—
Geochemical	6,012	—	—	—	—	—	—	—	—	6,012	—	—
Non-technical	77,832	—	—	—	—	—	573	525	91.6	78,405	525	0.7
Unknown	36,018	—	—	—	—	—	10,480	3,086	29.4	46,498	3,086	6.6
Totals	1,181,575	167,788	13.1	98,280	20,703	21.1	304,792	118,337	38.8	1,584,647	306,828	19.4

subsurface geology 21 per cent successful for all exploratory footage and 14 per cent for wildcat footage; geophysics 15 per cent successful for all exploratory footage and 11 per cent for wildcat footage.

It merits comment that seismic work scored 23 per cent success in new-field gas-wildcat ventures located solely on the basis of its findings.

A new depth record for California was set by Pacific Western Oil Corporation, National Royalties No. 1 Miramonte, in Sec. 5, T. 26 S., R. 22 E., Kern County.

TABLE III-A

RECAPITULATION OF TABLE III

FOOTAGE

	All Exploratory Wells			*New Field and New Pool Wildcats Only*		
	Footage	*% of Total*	*Success %*	*Footage*	*% of Total*	*Success %*
SURFACE GEOLOGY						
By itself	71,401	5	5	66,246	6	5
Wherever involved	420,981	27	23	305,890	26	15
SUBSURFACE GEOLOGY						
By itself	516,963	33	21	311,586	26	14
Wherever involved	1,203,076	76	23	833,505	71	18
GEOLOGY—TOTAL						
By itself	963,017	61	23	601,273	51	15
Wherever involved	1,311,580	83	22	930,438	79	16
GEOPHYSICS—TOTAL						
By itself	142,152	9	15	131,275	11	11
Wherever involved	490,715	31	17	460,440	39	17
GEOCHEMICAL, NON-TECHNICAL AND UNKNOWN	130,915	11	3	119,862	10	—

This well reached 16,668 feet and at the close of 1946 was the deepest well in the world. The bottom-hole formation was lower Miocene.

DISCOVERIES

There were 14 oil and 4 gas fields (Table IV) and 16 new oil pools and 3 new gas pools (Tables V and VI) discovered in 1946. None of these can be classed as a major discovery. Developments to date indicate that East Los Angeles in the Los Angeles basin and Salt Creek in the San Joaquin Valley are the two 1946 oil-field discoveries most likely to succeed, and Winters seems to qualify in like manner among the new gas fields. The more important oil pool discoveries include those in Cymric and Elk Hills in the San Joaquin Valley, Newhall-Potrero and the Ramona area of Del Valle in the Coastal District, and Newport and Potrero in the Los Angeles basin.

South Belridge, Elk Hills and the Santiago area of Midway-Sunset in the San Joaquin Valley and the 237 pool of Wilmington in the Los Angeles basin derived the greatest benefit from successful outposts.

TABLE IV

1946 Discoveries in California: Successful New Field Wildcats

Operator	Discovery Well	County	Location S-T-R	Completion Date	Total Depth (Feet)	Net Discovery Footage	Initial Production B/D	Name of Producing Formation	Name of New Field Discovered	Method of Locating Discovery Well
WELLS DRILLED PRIMARILY IN SEARCH OF OIL										
1. Bender Oil	Claire 2	Kern	22-28s-28e	8-16	2,761	2,747	10	Vedder	?	Subsurface
2. Brit. Amer. and Texas Co.	Bodger 1	Los Angeles	22-3s-14w	8-26	9,154	9,154	933	Miocene	Alondra	Subsurface and gravity
3. Darling, O. F.	McNear 1	Kern	1-31s-29e	12-1	2,600	2,580	30	Chanac	Rockpile School	Subsurface
4. General Petroleum	Librown 1	Los Angeles	21-3s-11w	2-22	12,600	12,528	154	Puente	La Mirada	Subsurface and seismic
5. Independent Exploration	Temblor 1	Kern	17-29s-21e	1-10	2,920	1,020	20	Tulare	Salt Creek	Subsurface
6. Pacific Oil and Gas	Cantleberry 72	Kern	22-25s-27e	7-25	2,794	2,794	76	Lower Vedder	Jasmin	Subsurface
7. Richfield Oil	U.P. Unit 1	Los Angeles	9-2s-12w	2-2	9,629	8,590	214	Puente	East Los Angeles	Subsurface and seismic
8. Richfield Oil	Vail 1	Los Angeles	16-2s-12w	2-25	7,952	7,952	234	Puente	Vail Pool[b]	Subsurface and seismic
9. Shell Oil	Dominguez Est. 1	Los Angeles	2-4s-13w	2-15	10,478	10,478	91	Miocene	Dominguez, East	Subsurface and seismic
10. Shell Oil[a]	Six Co. Fee 1	Los Angeles	2-3s-15w	8-13	7,033	6,940	230	Miocene	North El Segundo	Subsurface, seismic and gravity
11. Standard of California	Lewis Comm. 1	Los Angeles	11-3s-11w	9-22	12,184	7,660	65	Repetto	Leffingwell	Surface, subsurface and seismic
12. Standard of California	Wigdal 1	Los Angeles	19-3n-16w	9-13	9,525	9,370	60	Eocene	Oat Mountain	Surface and subsurface
13. Texas Company	Deaton	Los Angeles	7-4n-17w	2-29	4,802	4,117	26	Modelo	Black Ranch	Surface and subsurface
14. Texas Company	West Pet 1	Kern	29-30s-22e	10-21	5,173	5,173	140	Oceanic	Belgian	Surface and subsurface
WELLS DRILLED PRIMARILY IN SEARCH OF GAS										
15. Amerada Petroleum	H. D. Winship A-1	Solano	15-6n-2e	7-14	5,000	4,816	1,470[c]	Eocene	Northwest Maine Prairie	Seismic
16. Shell Oil	McCune 1	Solano	29-6n-1e	2-2	5,528	5,252	11,000[c]	Cretaceous	Winters	Seismic
17. Standard of California	Donohoe Fee 1	Butte	6-20n-1e	7-16	6,000	2,155	5,039[c]	Eocene	Durham	Seismic
18. Texas Company	Hermle 1	Yolo	22-11n-1w	2-14	4,022	2,618	3,030[c]	Cretaceous	Dunnigan Hills	Subsurface and seismic

[a] Operator for Richfield, Shell, Standard of California, Texas Company, Tide Water Associated, and Union Oil companies.
[b] Well started as new field wildcat but finished as discovery well of Vail pool in East Los Angeles field.
[c] MCF per day.

TABLE V

1946 Discoveries in California: Successful New Pool Wildcats

Operator	Discovery Well	County	Location S-T-R	Completion Date	Total Depth (Feet)	Net Discovery Footage	Initial Production B/D	Name of Producing Formation	Name of New Pool Discovered[a]	Method of Locating Discovery Well
WELLS DRILLED PRIMARILY IN SEARCH OF OIL										
19. Basin Oil	Standard Brick 1	Los Angeles	28-2s-14w	10-18	10,418	10,418	248	Miocene	Inglewood City (Potrero)	Subsurface
20. Basin Oil	Stern 1	Orange	33-3s-9w	9-1	4,840	4,840	100	Puente	Lower Kraemer (Richfield)	Subsurface
21. Bender Oil	Kelly 2	Kern	20-28s-27e	6-11	3,518	3,470	100	TSM Trans.	Hoover (West Premier)	Subsurface
22. Fairfield, F. E.	West Mountain 1	Ventura	23-3n-21w	7-7	5,048	5,048	80	Sespe	? (West Mountain)	Surface and subsurface
23. Feldman, D. D.	Richardson Est. 1	Ventura	23-3n-21w	9-3	4,676	4,067	50	Sespe	? (West Mountain)	Surface and subsurface
24. Magee, H. H.	Bolton 2	Kern	22-29s-21e	1-3	6,006	5,075	354	Carneros	Bolton (Cymric)	Subsurface
25. Morton and Sons	Anaheim 7-1	Orange	7-6s-10w	7-6	6,465	5,550	823	Puente	Anaheim Sugar (Newport)	Subsurface
26. Signal Petroleum	Callens 1	Orange	18-6s-10w	7-12	4,429	3,850	460	Puente	Callens (Newport)	Subsurface and trend
27. Standard of California	UONPR No. 344-24Z	Kern	24-30s-22e	5-8	5,812	5,812	377	Stevens	"24Z" (Elk Hills)	Surface and subsurface
28. Western Gulf Oil	Di Giorgio 1	Kern	10-31s-29e	11-15	6,163	6,163	400	Schist	Di Giorgio (Mt. View)	Subsurface
WELLS DRILLED PRIMARILY IN SEARCH OF GAS										
29. Shell Oil	Wagenet 1	Solano	24-4n-1w	11-15	2,934	2,455	3,500[b]	Domengine	Wagenet (Kirby Hill)	Subsurface and trend
30. Standard of California	Fontana Farms 4	Solano	31-4n-1e	1-3	5,800	2,988	1,968[b]	Nortonville	Fontana 4 (Kirby Hill)	Surface
31. Standard of California	Kirby Community 1	Solano	31-4n-1w	5-4	2,350	2,108	4,177[b]	Domengine	Kirby 1 (Kirby Hill)	Surface and trend

[a] Field names in brackets.
[b] MCF per day.

MCF per day.

TABLE VI

1946 Discoveries in California

Successful Deeper and Shallower Pool Tests

Operator	Discovery Well	County	Location S-T-R	Completion Date	Total Exploration Footage[a]	Net Discovery Footage	Initial Production B/D	Name of Producing Formation	Name of New Pool Discovered[b]	Method of Locating Discovery Well
WELLS DRILLED PRIMARILY IN SEARCH OF OIL										
DEEPER POOL TESTS										
32. Bell-Casmite	Arrelanes 2	Santa Barbara	13-9n-35w	4-12	3,450	2,300	287	Lospe	Arrelanes (Casmalia)	Subsurface
33. Independent Exploration	Temblor 2	Kern	17-29s-21e	3-13	1,868	1,868	304	Carneros	Carneros (Salt Creek)	Subsurface
34. Superior Oil	Woody 77	Kern	22-29s-21e	3-22	1,200	1,200	58	Pt. of Rocks	Woody (Cymric)	Subsurface
SHALLOWER POOL TESTS										
35. Bankline Oil	Black 102	Ventura	13-4n-18w	6-18	2,335	2,335	150	Pliocene	Black (Ramona)	Subsurface
36. Barnsdall Oil	R.S.F. 53-5	Los Angeles	26-4n-17w	6-23	8,790	8,970	533	Miocene	5th Zone (Newhall-Potrero)	Subsurface
37. Standard of California	Weston 271-27W	Kern	27-29s-21e	11-9	4,030	4,030	291	Phacoides	"271" Sand (Cymric)	Subsurface

[a] Successful deeper pool tests drilled an additional 7,600 feet of non-exploratory hole to pass depths of previously productive pools.
[b] Field names in brackets.

TABLE VII

Unsuccessful California Exploratory Wells that Reached Basement in 1946

Operator and Lease	Location S-T-R	Total Depth	Formation	Operator and Lease	Location S-T-R	Total Depth	Formation
KERN COUNTY				**LOS ANGELES COUNTY**			
38. Amerada Petroleum 38-10 Barnett	10-29s-29e	4,280	Granite	63. Amapola Oil 1 Amapola	6-6n-12w	1,800	Granite
39. Amerada Petroleum 76-15 S.P.	15-29s-29e	4,594	Schist	94. Del Sur Oil 1 Del Sur	26-7n-13w	3,025	Granite
40. Amerada Petroleum 1-22 Siegfus	22-29s-29e	4,282	Schist	65. Jergins Oil 1 Torrance	8-4s-14w	5,735	Schist
41. Amerada Petroleum 27 Waglay	14-29s-29e	4,518	Schist	66. Lyddon, A. W. 3-1 Rowland Estate	17-2s-10w	8,667	Granite
42. Bandini Petroleum 1 Jasmin	35-25s-27e	2,899	Granite	67. Ohio Oil 4-1 Gardena	23-3s-14w	10,288	Schist
43. Continental Oil 1 U.S.L. Reay	28-29s-30e	1,438	Schist	68. Seaboard Oil 1-A Evans	23-3n-16w	8,210	Basement
44. Finch *et al.* A-5 Tejon	34-12n-18w	596	Granite	69. Shell Oil 48A Alamitos	29-4s-12w	14,950	Schist
45. Finch *et al.* A-6 Tejon	32-12n-18w	3,556	Granite	70. Standard of Calif. 2 Six Companies Fee	2-3s-15w	7,075	Schist
46. Finch *et al.* 13 Finch, Villard 1	27-25s-28e	697	Granite	71. Superior Oil 66 Torrance	24-4s-14w	4,839	Schist
47. General Petroleum 58 Speed Fee	11-30s-29e	3,073	Schist	72. Texas Company 9-1 Gardena	26-3s-14w	10,085	Schist
48. Gieck, E. 1 Woodworth	30-31s-30e	5,185	Schist	**MADERA COUNTY**			
49. Gilmour, L. S. 1 Tejon	36-32s-29e	1,436	Granite	73. Union Oil 7 Gamble	19-9s-16e	3,085	Granite
50. Gilmour, L. S. 2 Tejon	25-32s-29e	1,275	Granite	**MONTEREY COUNTY**			
51. Maurer and Fisher 1-A Jean	15-26s-28e	1,159	Schist	74. C.C.M.O. Company 1 Salanco	35-19s-7e	2,627	Granite
52. Maurer and Fisher 3 Jean	16-26s-28e	1,520	Schist	**TULARE COUNTY**			
53. Maurer and Fisher 4 Jean	15-26s-28e	1,117	Schist	75. General Petroleum 42-30 Moran	30-22s-26e	4,646	Schist
54. Reid, Gene 1 Angus	19-31s-30e	4,605	Granite	76. McDuffie, W. C. 1 Bennett	15-18s-23e	5,370	Basement
55. Reid, Gene 1 K.C.L.	15-26s-28e	1,185	Schist	77. Reid, Gene 1 Murray	21-22s-27e	1,433	Granite
56. Signal Petroleum 1 Di Giorgio	1-31s-29e	2,044	Granite	78. Reid, Gene 1 Wing	22-23s-27e	2,321	Schist
57. Standard of California 72-29	29-29s-29e	5,545	Granite	79. Shell Oil 14-1 Sunnyvale	29-23s-26e	4,825	Schist
58. Tide Water Associated Oil 154 Luck	30-28s-28e	5,908	Granite	80. Transcal Drilling 1 Harris	34-16s-23e	2,603	Schist
59. Tide Water Associated Oil 113 M & S	29-28s-28e	6,152	Granite	81. Union Oil 45-8 Griffin	8-22s-26e	3,746	Slate
60. U. S. Drilling 1 Bohen	27-26s-28e	1,640	Basement	82. Union Oil 22-6 Reed	6-22s-26e	3,931	Slate
61. Union Oil 71-3 Di Giorgio	3-31s-29e	4,705	Schist	83. United Exploration 1 United	12-18s-23e	3,836	Slate
62. Union Oil 62-3 Di Giorgio	3-31s-29e	4,684	Schist				

ADDITIONS TO RESERVES

Additions to California's oil reserves during 1946, derived from the annual reserves report of the American Petroleum Institute, were 13,876,000 barrels from new fields and new pools, and 118,280,000 barrels from extensions—a total of 132,147,000 barrels, which was 42 per cent of the year's withdrawals.

Additions to reserves of dry gas fields amounted to about 110,000,000 MCF, or 21 per cent of production.

DEVELOPMENTS

There were 1,375 producing oil wells completed during the year, a decrease of 18 per cent from 1945. They had a rated average initial production of 287 barrels daily; this is a 38 per cent increase over the average daily rate of 1945 completions. These production and completion figures are taken from annual statistical reports issued by the American Petroleum Institute.

The 12 most active oil fields from the standpoint of development were the following.

	Number of Producing Wells Completed	*Rated Initial Production Barrels Daily*	
		Total	*Per Well Average*
Wilmington	183	107,352	587
Cymric	108	17,758	164
South Belridge	83	2,155	26
Edison	72	36,005	500
Newport	70	11,629	166
Huntington Beach	52	14,324	275
Santa Maria Valley	46	7,708	168
Lost Hills	41	1,749	43
Tejon	38	3,423	90
Ventura Avenue	38	18,530	488
Kern Front	34	2,280	67
Del Valle	31	4,614	149

Fifty-five producing wells were completed in dry gas pools, one more than in 1945. The two most active gas fields were Trico with 19 and Rio Vista with 17 producers completed.

Production during 1946 was as follows.

Oil	315,178,000 barrels
Natural gas liquids, including condensate	21,885,000 barrels
Oil-well gas	351,228,300 MCF
Dry gas-field gas	181,233,200 MCF

TRENDS

Production and reserves data used in the preparation of Figure 4 and Panel 4, Figure 3, are based on annual reports of the American Petroleum Institute. Both condensate and crude oil are included in the calculations for each year from 1940 to 1946, inclusive. The American Petroleum Institute included only crude oil reserves and production in its report as of December 31, 1946, but these figures have been adjusted so that they are comparable with those of previous years.

It should be emphasized that the estimates of reserves added by new fields and new pools, as used in Figures 3 and 4, have been made at the ends of discovery years and have been proved conservative in most cases. The reserves committee of the American Petroleum Institute prepares the most reliable estimates of newly discovered reserves with which the writer is familiar but is limited in its

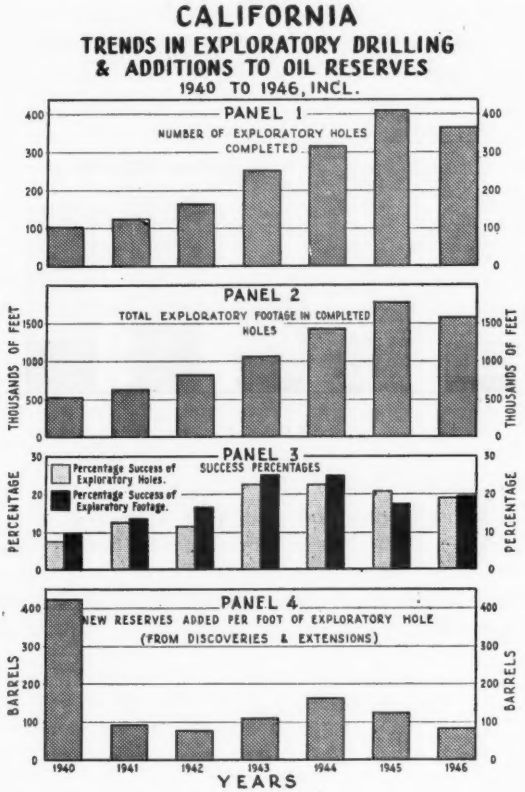


FIG. 3

calculations by data available at the end of the discovery year. Subsequent annual additions to reserves of these newly discovered pools are credited to extensions or revisions but do not appear in the discovery record. It is to be expected, therefore, that the American Petroleum Institute's estimates of oil discovered each year will be conservative and will be subject to upward revision as development of the new discoveries progresses.

The graphic presentations of comparative annual (1940 to 1946, inclusive) figures of amount and success of exploratory drilling (Figure 3) and of additions to reserves (Figure 4) indicate a downward trend in number of exploratory holes,

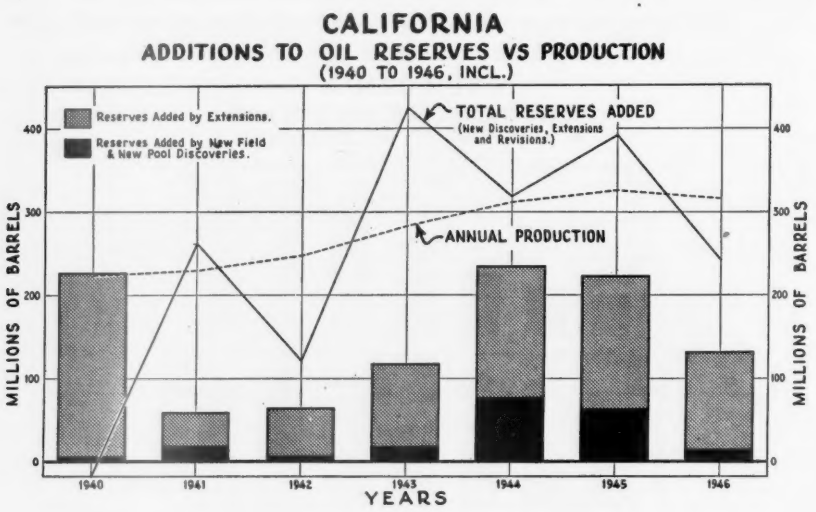


FIG. 4

in amount of exploratory footage, and in additions to reserves. The well sustained success percentages in 1946, both as to number of wells and footage, indicate that exploratory technique in California is efficient. The comparatively small rewards in the form of either total reserves added or reserves added per foot of effort indicate the continued difficulty experienced in finding substantial new supplies of crude oil.

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DEVELOPMENTS IN CANADA IN 1946[1]

FRANK L. FOURNIER[2]
Toronto, Ontario

ABSTRACT

Exploration drilling and geophysical work was at an increased rate in Canada during 1946. The Viking-Kinsella gas field was considerably enlarged and 3 new gas fields were discovered, namely, Provost, Elk Point, and Pendant d'Oreille. The Lloydminster heavy-oil field was considerably extended with 3 new pool discoveries. This resulted in Saskatchewan moving into third place as an oil producer, following Alberta and Northwest Territories. Development of the field, however, is retarded because of the heavy gravity of the oil. A new oil pool of unknown extent was found in the South Princess area on the central Alberta plains which should encourage further development in 1947.

A large area of semi-solid bitumen and richly impregnated bituminous sand was discovered in the Mildred-Ruth lakes area of the Athabaska district by the Dominion Government Department of Mines and Resources.

A new oil and gas field was discovered during the year near Wallaceburg, Ontario.

INTRODUCTION

Alberta was again the most active province of Canada in regard to exploratory drilling, followed by Ontario and Saskatchewan. Oil and gas discoveries were made in these three provinces but the new production has so far been unable to offset the decline in Canada's largest field, Turner Valley. This situation is particularly serious, for the demand for crude has not diminished with the ending of hostilities.

Canada produced about 11 per cent of its demand during 1946, the balance being imported from the United States and South America.

PRODUCTION IN CANADA (BARRELS)

	1945	*1946*
Alberta	8,055,440	7,138,532
Saskatchewan	16,509	136,346
Ontario	113,084	122,032
New Brunswick	31,027	28,581
Northwest Territories	353,137	181,408
	8,569,197	7,606,899

The daily average in 1946 was 20,841 barrels, which is a 2,636-barrel decrease from the daily average of 23,477 barrels in 1945.

EXPLORATION

Alberta.—Altogether, 128 wells were completed in Alberta, making a total footage of 486,657 feet; of these, 94 wells are classified as exploratory tests with a footage of 344,310 feet. These footages give an average depth of 3,802 feet for all types of wells compared with 3,662 feet for exploratory wells. The classification

[1] Published by permission of T. A. Link, chief geologist, Imperial Oil Limited. Manuscript received, March 16, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Senior staff geologist, Imperial Oil Limited. Data for report obtained mainly from files of Imperial Oil Limited, 56 Church Street, Toronto, Ontario.

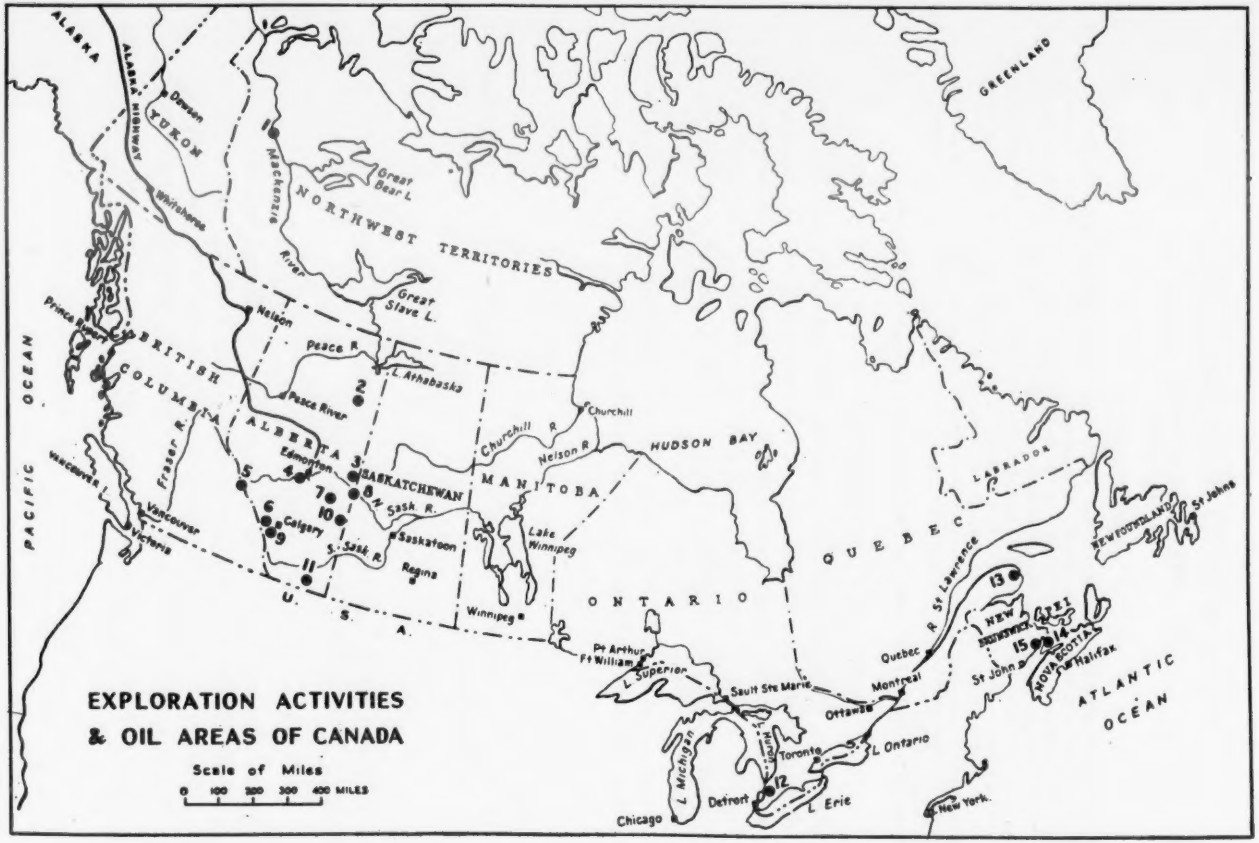

FIG. 1.—Exploration activities and oil areas of Canada in 1946. 1, Norman Wells oil field, Northwest Territories; 2, Mildred-Ruth lakes bituminous area, Fort McMurray; 3, Elk Point gas discovery; 4, Leduc seismic and drilling area; 5, Brazeau and Stolberg wildcat areas; 6, Jumping Pound oil and gas field; 7, Viking-Kinsella gas field; 8, Lloydminster oil field; 9, Turner Valley oil field; 10, Provost gas field; 11, Pendant d'Oreille gas field; 12, Becher oil and gas field; 13, Gaspé wildcat area; 14, Amherst area, Nova Scotia; 15, Stoney Creek gas and oil field, New Brunswick.

system proposed by F. H. Lahee,[3] has been followed in determining the wildcat wells.

The 1946 exploration drilling in Alberta was widespread, with wells located in both the foothills and plains. Of particular interest is the move northward in Alberta, with drilling at Duvernay, Elk Point, Deville, and Leduc.

Five of the companies operating in Alberta are jointly planning to drill a location near the Muskeg River in the northern foothills. The structure is a large surface anticline which has been checked with a seismic profile. The inaccessibility of the location necessitates the construction of a 70-mile road north from Entrance. At the end of the year, about 50 miles of the road had been bulldozed and graded. It is estimated that this wildcat will ultimately cost about $1,000,000.

Turner Valley.—Two exploratory wells, Home Millarville Nos. 20 and 21, were drilled 1 mile and 4 miles respectively northwest of the most northerly producer in an endeavor to extend the field; both wells found salt water in the Rundle (Madison) limestone.

Home Millarville Nos. 22, 23, and 24 are new north-end producers which extend the field westward. Home Millarville No. 24 made a 1,400-barrel well after acidizing, which has given encouragement for further drilling on the west-side fault block of north Turner Valley.

Developments in the last 2 years have shown that Turner Valley splits into 4 separate producing fault blocks at the north end of the field which merge to form 3 fault blocks immediately south of Township 21. On the most easterly of these, Continental No. 1, Foothills Nos. 23, 24, and 25 further delineated the producing area and helped to locate the east-side fault.

Jumping Pound.—The Shell Oil Company completed a third well, No. 16-14-J on the Jumping Pound structure, which encountered the Rundle (Madison) limestone at 10,335 feet. The depth of 6,288 feet below sea-level is 690 feet lower than the discovery well and only 328 feet higher than the second well which found water down-flank. The final testing showed an open flow of 1,193,000 cubic feet of gas daily with 95 barrels of salt water. The disappointing results at the third well clearly indicate that the prospects on the Jumping Pound structure are now limited to the possible development of a narrow wet-gas or distillate field.

Brazeau.—Brazeau Syndicate No. 1 completed a test of the Brazeau foothills structure at 11,689 feet after encountering 9 thrust faults. The Rundle limestone was found in two thin fault slivers at 9,498 feet and 11,351 feet. The highest fault block initially showed 6,560,000 cubic feet of gas daily and a showing of oil. The lower fault block was drilled 248 feet before the well faulted from Mississippian to Upper Cretaceous beds. The well is standing capped awaiting further developments in the area.

Stolberg.—Imperial Oil Limited and Shell Oil Company drilled a joint well to

[3] F. H. Lahee, "Exploratory Drilling and Statistics for 1943," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 28, pp. 701–21.

13,747 feet on an outer foothills fold known as the Stolberg anticline. The well, which is the deepest in western Canada, found the Mississippian Rundle limestone at 12,218 feet in a thrust block which is overriding a second Rundle limestone block at 12,826 feet. This unit in turn is thrust over the Rundle limestone encountered for the third time at 13,118 feet with 16 feet of Jurassic shale intervening. The limestone showed no evidence of production but tests in a sand zone in the Upper Cretaceous from 9,750 to 9,800 feet gave around 800,000 cubic feet of gas daily with from 2 to 9 barrels of 56° A.P.I. oil.

WILDCAT WELLS COMPLETED IN 1946

Well	*Location LS-Sec-Tp-Rg-Mer*	*Depth in Feet*	*Age of Strata Reached*	*Results*
ALBERTA FOOTHILLS				
Home Brazeau Synd. 1	Ls 15-17-43-17W5	11,689	Miss.	Gas. Suspended
Shell 16-14-J	Ls 16-14-25-5W5	10,578	Miss.	Gas 1,300 MCF/D
Roxana 3K	Ls 7-31-27-6W5	5,560	U. Cret.	Aband. Crooked hole
Elbow Falls 2A	Ls 4-28-22-6W5	3,158	Cambrian	To test—wet gas
Co-op Consumers 1	Ls 11-22-17-2W5	10,923	Miss.	Abandoned
Imp. Shell Stolberg 1	Ls 3-22-41-1W5	13,747	Miss.	Abandoned
Phillips Sul. Crk. 2	Ls 8-22-18-5W5	3,511	Jurassic	Abandoned
Home Millarv. 20	Ls 7-24-21-4W5	9,771	Miss.	Abandoned
Home Millarv. 21	Ls 11-34-21-4W5	9,972	Miss.	Abandoned
ALBERTA PLAINS				
Trans-Alta-Alliance 1	Ls 15-19-20-1W4	3,943	Devonian	Testing—Gas and oil shows
Princess Brooks Synd. 1	Ls 13-17-19-13W4	3,415	Miss.	23,000 MCF/D Gas well in L. Cret.
Princess Brooks Synd. 2	Ls 3-21-19-13W4	3,392	Miss.	Abandoned
C-S. Burdette Province 4	Ls 16-13-7-13W4	3,209	Miss.	Abandoned
McLeod Del Bonita 1	Ls 13-14-1-21W4	4,965	Miss.	Gas, oil—to test
Sun C.P.R. 1	Ls 11-8-18-16W4	4,894	Devonian	Abandoned
Empress Utilities 1	Ls 7-13-23-1W4	1,700	U. Cret.	Small gas well
C-S. Foremost Prov. 4	Ls 2-28-5-11W4	4,352	Devonian	Abandoned
Admiral Superior 1	Ls 2-9-1-17W4	3,090	Miss.	Abandoned
C-S. Irvine Prov. 28-32-11	Ls 16-32-11-2W4	3,385	Miss.	Gas show—aband.
Imp. Lethbridge 1	Ls 3-10-8-22W4	4,700	Miss.	Abandoned
Imp. Lethbridge 2	Ls 15-35-7-22W4	6,426	Devonian	Abandoned
Okalta Keho 1	Ls 1-16-11-22W4	4,877	Miss.	Abandoned
McColl-Front. Union 11B-6-2-8	Ls 11-6-2-8W4	3,303	Miss.	Abandoned
McColl-Front. Union 16D-29-1-9	Ls 16-29-1-9W4	3,236	Miss.	Abandoned
McColl-Front. Union 4-10-1-8	Ls 4-10-1-8W4	3,537	Miss.	Abandoned
McColl-Front. Union 9A-22-3-8	Ls 9-22-3-8W4	3,090	Miss.	Gas well in U. Cret.—48,000 MCF/D
McColl-Front. Union 4B-16-3-8	Ls 4-16-3-8W4	2,201	U. Cret.	Gas well in U. Cret.—8,000 MCF/D
McColl-Front. Union 7C-6-4-8	Ls 7-6-4-8W4	2,207	U. Cret.	Gas well in U. Cret.—15,000 MCF/D
McColl-Front. Union 6D-12-4-8	Ls 6-12-4-8W4	2,200	U. Cret.	Abandoned
McColl-Front. Union 11A-35-2-8	Ls 11-35-2-8W4	2,182	U. Cret.	Gas well, 8,530 MCF/D
McColl-Front. Union 10B-22-4-9	Ls 10-22-4-9W4	2,198	U. Cret.	Abandoned
McColl-Front. Union 6D-12-5-10	Ls 6-12-5-10W4	2,293	U. Cret.	Abandoned
C-S. Princess C.P.R. 38-31-19	Ls 15-31-19-11W4	4,120	Devonian	Abandoned
Princess Globe 1	Ls 2-3-20-12W4	3,420	Miss.	Abandoned
C.S. Princess C.P.R. 12-22A	Ls 1-22-20-12W4	4,139	Devonian	Abandoned
South Princess Synd. 1	Ls 9-28-19-12W4	3,460	Miss.	Abandoned
South Princess Synd. 2	Ls 4-4-19-11W4	4,205	Devonian	Oil well in Madison
South Princess Synd. 3	Ls 12-8-19-11W4	3,326	Miss.	Oil well in Madison
Imp. Sterling 2	Ls 7-13-7-20W4	3,942	Miss.	Abandoned
Gleddie Farm 1	Ls 1-25-17-13W4	1,300	U. Cret.	Gas well 800 MCF/D
B.A. Cal-Ward Prov. 78-23	Ls 13-23-22-12W4	4,080	Devonian	Abandoned
Imp. Youngstown 1	Ls 5-3-30-9W4	3,789	Miss.	Small gas well
Imp. Anglo Can.-Crossfield 1	Ls 9-11-28-2W5	9,526	Devonian	Abandoned—gas and oil shows
Royalite Dewinton 1	Ls 14-16-21-1W5	8,397	Miss.	Abandoned—gas and oil shows
Baxter Lake Oils 1	Ls 12-20-46-5W4	2,089	L. Cret.	Oil well in L. Cret.
AC-H-CE Beaverhill Lake 1	Ls 7-11-52-17W4	3,017	Devonian	Abandoned
Shunda Oils B1	Ls 5-20-55-20W4	2,325	U. Cret.	Suspended
Imp. Deville 1	Ls 9-36-51-20W4	3,636	Devonian	Abandoned
Imp. AC-H-CE Deville 2	Ls 11-36-51-19W4	2,620	L. Cret.	Abandoned
Imp. AC-H-CE Deville 3	Ls 11-36-52-19W4	2,674	L. Cret.	Abandoned
Imp. Duvernay 1	Ls 6-30-55-11W4	2,798	Devonian	Abandoned
Imp. Duvernay 2	Ls 11-29-55-12W4	2,969	Devonian	Abandoned
Imp. Duvernay 4	Ls 6-33-56-14W4	3,400	Devonian	Abandoned
Egerton Oils 4	Ls 10-18-43-4W4	2,677	Devonian	Abandoned
AC-H-CE Elk Point 1	Ls 7-26-56-5W4	3,929	Silurian	Salt well—750 ft. salt
AC-H-CE Elk Point 1A	Ls 7-26-56-5W4	1,653	L. Cret.	3,142 MCF/D gas

WILDCAT WELLS COMPLETED IN 1946—(*Continued*)

Well	*Location LS-Sec-Tp-Rg-Mer*	*Depth in Feet*	*Age of Strata Reached*	*Results*
AC-H-CE Elk Point 2	Ls 3-14-57-6W4	4,359	Silurian	Abandoned—gas show
AC-H-CE Elk Point 3	Ls 15-35-57-5W4	5,007	Cambrian	Gaswell—to test
Shell Fribourg 31-32	Ls 14-32-54-9W4	3,657	Devonian	Abandoned
AC-H-CE Fort Augustus 1	Ls 7-29-55-21W4	3,313	Devonian	Abandoned
Imp. Kinsella 4	Ls 11-16-49-9W4	1,993	U. Cret.	Gas well—873 MCF/D
Imp. Kinsella 5	Ls 7-11-48-9W4	1,940	U. Cret.	Gas well—8,000 MCF/D
Imp. Kinsella 6	Ls 10-11-47-9W4	2,039	U. Cret.	Suspended: 6,500 MCF/D
Imp. Kinsella 7	Ls 7-22-49-10W4	2,027	U. Cret.	Abandoned
Imp. Kinsella 8	Ls 11-22-49-11W4	4,182	Devonian	Abandoned
Imp. Kinsella 9	Ls 6-16-46-9W4	2,080	U. Cret.	Gas well: 10,500 MCF/D
Imp. Kinsella 10	Ls 10-29-49-13W4	2,211	U. Cret.	Gas well: 1,100 MCF/D
Imp. Kinsella 11	Ls 7-28-47-8W4	2,030	U. Cret.	Abandoned
Imp. Kinsella 12	Ls 7-28-48-8W4	1,985	U. Cret.	Abandoned
Imp. Kinsella 13	Ls 10-15-46-10W4	2,157	U. Cret.	Gas well—7,250 MCF/D
Imp. Kinsella 14	Ls 7-28-48-9W4	2,040	U. Cret.	Oil shows—aband.
Imp. Kinsella 16	Ls 6-6-46-8W4	2,146	U. Cret.	Gas well—1,460 MCF/D
Imp. Kinsella 17	Ls 7-14-46-11W4	2,310	U. Cret.	Gas well—1,210 MCF/D
Imp. Kinsella 18	Ls 11-27-45-10 W4	2,428	U. Cret.	Abandoned
Imp. Kinsella 21	Ls 7-28-50-13W4	2,143	U. Cret.	Abandoned
Imp. Kinsella 22	Ls 7-16-47-12W4	2,307	U. Cret.	Abandoned
Lloyd. Oil Prod. 3	Ls 13-11-50-2W4	1,998	L. Cret.	Oil well
Shaw Petroleums 4	Ls 15-35-49-1W4	1,892	L. Cret.	Oil and gas shows
Blackfoot 1	Ls 7-18-50-1W4	2,070	L. Cret.	Oil and gas shows
Commoil Lloyd. 2	Ls 4-12-50-1W4	2,006	L. Cret.	Abandoned
Husky Refinery 1	Ls 11-1-50-1W4	2,000	L. Cret.	Gas shows
Lloydbrook Synd. 1	Ls 1-2-51-1W4	1,845	L. Cret.	Oil well indicated
Zero Syndicate 1	Ls 13-11-52-2W4	2,066	L. Cret.	Abandoned
Commoil Lloyd. 3	Ls 6-10-50-1W4	1,953	L. Cret.	Gas and oil
Imperial Provost 1	Ls 3-27-37-3W4	2,549	L. Cret.	Gas in Viking sand. Gas and oil in L. Cret.
Imperial Provost 2	Ls 1-33-37-3W4	6,977	Cambrian	Gas well in U. Cret. 1,000 MCF/D
Imperial Provost 3	Ls 6-27-37-3W4	3,130	L. Cret.	Gas well in U. Cret. 4,700 MCF/D
Imperial Provost 4	Ls 6-28-37-2W4	2,551	U. Cret.	Gas well in U. Cret. 2,100 MCF/D
Imperial Provost 5	Ls 7-22-38-3W4	2,404	L. Cret.	Abandoned
Imperial Provost 6	Ls 10-35-37-4W4	2,422	U. Cret.	Gas well—13,200 MCF/D
Imperial Provost 7	Ls 7-1-38-5W4	2,470	U. Cret.	Abandoned
Iscris M 3	Ls 5-22-54-6W4	2,138	Devonian	Abandoned
AC-H-CE West Viking 1	Ls 10-11-48-15W4	3,008	Devonian	Abandoned
AC-H-CE West Viking 2	Ls 10-24-47-16W4	3,282	Devonian	Abandoned
SASKATCHEWAN				
Community Services 7	Ls 3-4-50-27W3	2,165	Devonian	Oil and gas shows
Van Lloyd 2	Ls 10-2-49-28W3	1,880	L. Cret.	Oil well
Lloyd. Gas Co. 5	Ls 9-26-49-28W3	2,001	L. Cret.	Abandoned
Lloyd. Gas Co. 6	Ls 13-24-49-28W3	1,871	L. Cret.	Oil well
Community Services 20	Ls 6-13-49-28W3	2,012	L. Cert.	Oil well indicated
West Central 1	Ls 13-35-48-28W3	1,896	L. Cret.	Oil well
Husky O. & G. Dev. 3	Ls 2-28-47-27W3	2,252	L. Cret.	Oil well indicated
Husky O. & G. Dev. 4	Ls 4-14-47-27W3	1,833	L. Cret.	Oil and gas discovery
Northeast Synd. D.B. 1	Ls 6-13-48-28W3	1,866	L. Cret.	Oil and gas indicated
Withers Lone Rock 1	Ls 13-6-47-26W3	1,790	L. Cret.	Oil well
Groat Furness 25	Ls 16-12-48-28W3	1,847	L. Cret.	Oil well
Community Serv. 29	Ls 5-10-50-26W3	2,300	L. Cret.	Standing Shows oil and gas
Community Serv. 30	Ls 11-31-48-27W3	1,872	L. Cret.	Oil and gas, standing
United Pete 1	Ls 5-32-48-27W3	2,032	L. Cret.	Abandoned
Community Serv. Battle 1	Ls 8-30-43-16W3	2,379	—	Suspended
Bata Provost 1	Ls 4-5-35-28W3	3,161	L. Cret.	Suspended—oil and gas shows
Imp. Davidson 1	Ls 16-8-27-1W3	5,234	Silurian	Abandoned
Imp. Davidson 2	Ls 13-10-27-2W3	4,577	Silurian	Abandoned
Cypress—Fox Valley	Ls 16-26-17-26W3	3,241	—	Suspended
Commun. Serv. Watrous	Ls 4-2-32-25W3	3,868	—	Dry hole, suspended
Bata Petroleums 13	Ls 10-3-39-22W3	2,174	Devonian	Abandoned
Bata Petroleums 14	Ls 14-28-38-22W3	2,265	Devonian	Abandoned
Bata Petroleums 15	Ls 13-13-41-24W3	2,081	L. Cret.	Gas well in U. Cret.
Verbata Gas and Oil 2	Ls 7-24-41-24W3	4,490	Cambrian?	Gas in Viking zone 875 MCF/D—Salt in Silurian
Torch River Synd. 1	Ls 5-14-52-15W3	1,201	—	Dry hole—suspended
NORTHWEST TERRITORIES				
Imp. Redstone No. 1	On Redstone River —90 miles southwest of Norman Wells	4,874	Silurian	Abandoned
Imp. Whirlpool No. 1	On Whirlpool River —68 miles northwest of Norman Wells	6,417	Devonian?	Abandoned

WILDCAT WELLS COMPLETED IN 1946—(*Continued*)

Well	*Lot*	*Location Conc.*	*Twp.*	*Depth in Feet*	*Age of Strata Reached*	*Results*
ONTARIO						
Union Imperial 2	5	13	Chatham	3,998	Precambrian	Dry and abandoned
Union Imperial 3	14	11	Tilbury W.	3,496	Precambrian	Dry and abandoned
Imp. Tape 1	11	5	Raleigh	3,685	Ordovician?	Oil shows—testing
Imp. Fleming 1	7	4	Raleigh	3,738	Precambrian	Gas well—290 MCF/D
Imp. Houston	9	5	Raleigh	3,765	Precambrian	Dry and abandoned
Imp. Rhodes 1	10	6	Raleigh	3,758	Precambrian	Dry and abandoned
Imp. Cleland 1	1	1W.C.R.	Harwich	702	Devonian	Dry and abandoned
Imp. Fallax 1	17	2L.E.S.	Harwich	647	Devonian	Dry and abandoned
Imp. Burchiel 1	21	3L.E.	Harwich	647	Devonian	Dry and abandoned
Imp. Colley 1	7	5	Aldborough	317	Devonian	Dry and abandoned
Imp. Spence 1	17	12	Oxford	571	Devonian	Dry and abandoned
Imp. Moravian 1	68		Oxford	524	Devonian	Dry and abandoned
Imp. Moravian 2	42		Oxford	525	Devonian	Dry and abandoned
Imp. Hough 1	12	1W.C.R.	Harwich	785	Devonian	Dry and abandoned
Imp. Krisan 1	12	2E	Harwich	648	Devonian	Dry and abandoned
Imp. Stoneman 1	12	12	Sombra	875	Devonian	Dry and abandoned
Imp. E. J. White 1	13	9	Moore	780	Devonian	Dry and abandoned
Imp. Boothe 1	18	6	Moore	600	Devonian	Dry and abandoned
Imp. G. White 1	16	8	Moore	586	Devonian	Dry and abandoned
Imp. Robbins 1	23	8	Moore	825	Devonian	Dry and abandoned
Imp. Boles 1	13	11	Tilbury E	507	Devonian	Dry and abandoned
Imp. Gibson 1	34	3	Euphemia	562	Devonian	Dry and abandoned
Imp. Hansford 1	32	2	Enniskillen	500	Devonian	Dry and abandoned
Imp. Cox 1	14	4	Maidstone	592	Devonian	Dry and abandoned
Imp. Henderson 1	3	2	Brooke	350	Devonian	Small oil well
Imp. Wanut 1	21	11	Brooke	418	Devonian	Dry and abandoned
Imp. Jardine 1	23	8	Enniskillen	431	Devonian	Small oil well
Imp. Law 1	26	9	Enniskillen	720	Devonain	Small oil well
Imp. Worts 1	27	8	Enniskillen	495	Devonian	Small oil well
Imp. Moore 1	28	9	Enniskillen	410	Devonian	Small oil well
Imp. Law 2	26	9	Enniskillen	525	Devonian	Dry and abandoned
Imp. Watt 1	25	8	Enniskillen	560	Devonian	Dry and abandoned
Imp. Freer 1	27	9	Enniskillen	415	Devonian	Small oil well
Imp. Shortt 1	29	10	Enniskillen	544	Devonian	Dry and abandoned
Imp. Wilsoncraft 1	24	8	Enniskillen	500	Devonian	Dry and abandoned
Imp. Kelly 1	24	12	Enniskillen	446	Devonian	Dry and abandoned
Imp. Kelly 2	24	12	Enniskillen	201	Devonian	Dry and abandoned
Imp. Stonehouse 1	26	12	Enniskillen	175	Devonian	Dry and abandoned
Imp. Seckerton 1	20	7	Moore	575	Devonian	Dry and abandoned
Imp. Henry 1	19	7	Oxford	1,900	Silurian	Dry and abandoned
Imp. Johnston 1	24	6	Moore	2,644	Silurian	Dry and abandoned
Imp. Campbell 1	21	4	Harwich	1,962	Silurian	Dry and abandoned
Imp. D. Ferguson 1	7	12	Yarmouth	1,310	Silurian	Dry and abandoned
Imp. Addison 1	14	4	Maidstone	1,852	Silurian	Dry and abandoned
Imp. Arthur 1	8	10	S. Norwich	915	Silurian	Dry and abandoned
Imp. Bechard 1	9	5	Sombra	1,856	Silurian	Oil well—20 bbls/day
Imp. Murphy 1	8	4	Gore of Chatham	2,092	Silurian	Gas shows—working over
Imp. R. Van Damme 1	11	5	Sombra	2,131	Silurian	Oil show—abandoned
Imp. McCreary 1	21	6	Sombra	1,970	Silurian	Gas well—570 MCF/D
Imp. DeCoster 1	9	4	Gore of Chatham	2,132	Silurian	Dry and abandoned
Imp. Wade 1	19	6	Sombra	1,953	Silurian	Gas well— 240 MCF/D
Imp. S. Bechard 1	9	5	Sombra	1,895	Silurian	Gas well—1,250 MCF/D
Imp. W. F. Johnston 1	10	5	Sombra	1,830	Silurian	Gas well—2,000 MCF/D
Imp. Becher 1	9	5	Sombra	1,905	Silurian	Gas well— 800 MCF/D
Imp. Raymond 1	18	6	Sombra	1,934	Silurian	Gas well— 200 MCF/D
Imp. Carnegie 1	14	11	Tilbury W.	1,795	Silurian	Dry and abandoned
Union Gas Z.61	12	2	Aldborough	1,614	Silurian	Show gas
Union Gas Z-64	8	1	Aldborough	1,585	Silurian	Abandoned
Union Gas Z.66	9	1	Aldborough	1,625	Silurian	Show gas
Union Gas Z.68	10	2	Aldborough	1,573	Silurian	Show oil and gas
McKercher 1	18	14	Brooke	490	Devonian	Abandoned
Union Gas C.80	24	1	Chatham	1,774	Silurian	Gas shows
Union Gas C.81	22	2 Fr.	Chatham	1,684	Silurian	Gas shows
Union Gas C.83	16	6	Chatham	1,737	Silurian	Abandoned
Roth 2	31	8	Dawn	600	Devonian	Abandoned
Beattie 1	2	3	Enniskillen	487	Devonian	Oil and gas shows
Roth 1	10	4	Enniskillen	705	Devonian	Abandoned
Roth 3	7	9	Enniskillen	500	Devonian	Abandoned
Union Gas E.2	12	4	Enniskillen	2,059	Silurian	Oil show
Union Gas E.3	16	4	Enniskillen	2,070	Silurian	Oil show
Kennedy 2	5	10	Moore	762	Devonian	Abandoned
Dominion Gas R.222	202	NTR	Romney	1,434	Silurian	Gas show

Alberta syncline.—Two wildcat wells were drilled in the Alberta syncline in the vicinity of Calgary following detailed seismic surveys. Water was encountered at Imperial Anglo-Crossfield No. 1 in both the Mississippian and Devonian limestone after drilling to the total depth of 9,526 feet. The basal Cretaceous sand yielded 630,000 cubic feet daily of wet gas with a showing of oil. Sand zones at the top of the Upper Cretaceous Blairmore formation were perforated to increase the gas flow to a rate of 843,000 cubic feet per day plus a few gallons of 50° A.P.I. crude oil. The well was abandoned as uncommercial.

Royalite Dewinton No. 1 was drilled on an east-west surface fold detailed by a seismic survey. The well was abandoned in the Rundle limestone at 8,397 feet. A thorough testing of oil and gas showings in the Lower Cretaceous, Jurassic, and Mississippian failed to find commercial production.

Kinsella.—Imperial Oil Limited continued exploratory drilling to outline the producing limits of the Viking-Kinsella gas field. In all, 17 extension wells and 4 development wells were drilled during the year, of which 12 were proved to be commercial-sized gas producers with an average initial production of 4,500,000 cubic feet daily. The gas sand, commonly present at a depth around 2,000 feet, was thin or absent in 9 wells which were abandoned. As a result of the drilling, the proved area is now 300,000 acres.

Provost.—Exploratory drilling on a seismic structure resulted in the discovery of a new gas field near the town of Provost. However, the seismic structure was not verified by this drilling since the field was proved to be a stratigraphic trap. Imperial Provost No. 1 encountered gas in the Viking zone at 2,371 feet. The Manville formation at the top of the Lower Cretaceous produced 64 barrels of 21° A.P.I. oil initially which, upon continued production, rapidly decreased to 10–15 barrels a day with 20 per cent water. The well was abandoned after producing for 3 months.

Of 6 extension wells following the new discovery, 2 were dry holes and 4 were completed as gas wells in the Viking sand, with an average open flow of 5,250,000 cubic feet daily.

Wainwright.—Baxter Lake No. 1, a wide step-out 12 miles northeast of Wainwright, discovered a new pool. The well produced initially 60 barrels of 18° A.P.I. oil with 12 per cent water from the Lower Cretaceous. The well is 50 feet higher than other wells in the general Wainwright area.

Elk Point.—Anglo-Canadian, Home, C. & E. Elk Point No. 1A was a new discovery completed in the Lower Cretaceous which gave 3,000,000 cubic feet of gas per day from a depth of 1,305–1,320 feet. A second well drilled by these companies was abandoned in the Cambrian at 4,359 feet. A formation-tester was lost in the hole before oil and gas showings at the bottom of the hole could be tested. The Lower Cretaceous showed 350,000 cubic feet per day of dry gas. A No. 3 well was drilled to the Cambrian and plugged back for testing of the Lower Cretaceous the following year.

Princess.—South Princess Syndicate No. 2 was drilled to 4,205 feet, finishing

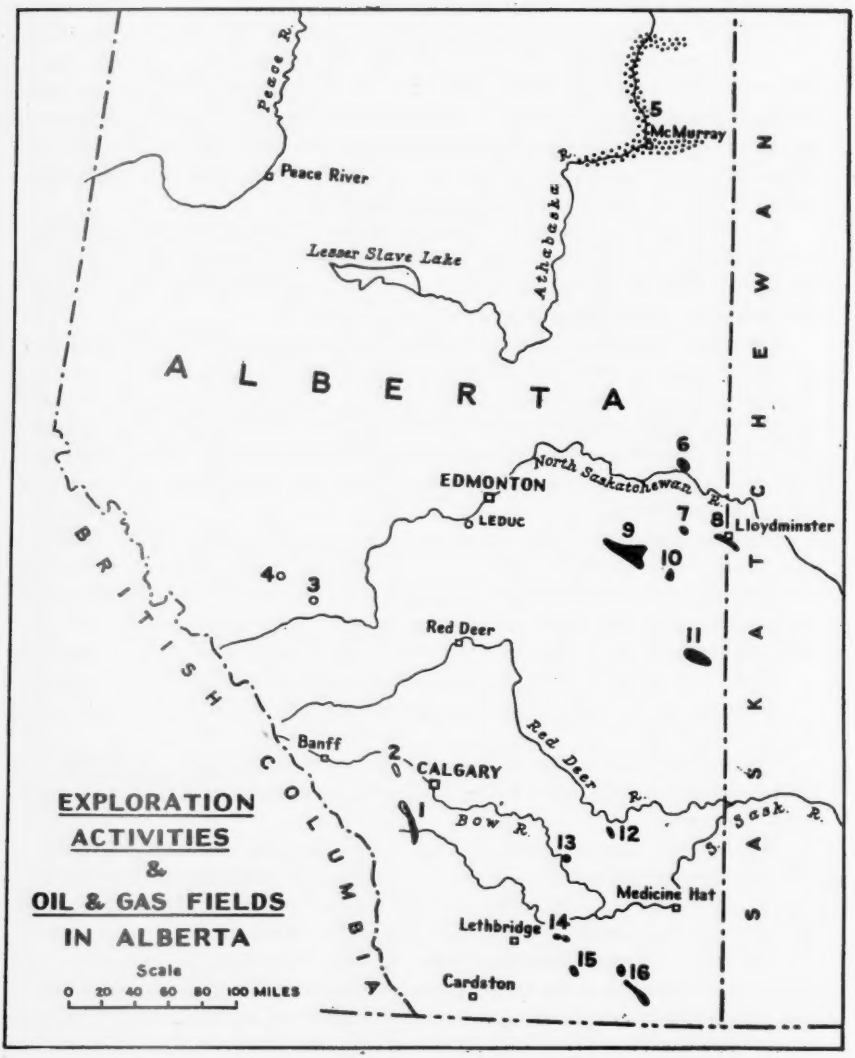

FIG. 2.—Exploration activities and oil and gas areas of Alberta in 1946. 1, Turner Valley oil field; 2, Jumping Pound oil and gas field; 3, Stolberg well; 4, Brazeau well; 5, Mildred-Ruth lakes bituminous area; 6, Elk Point gas discovery; 7, Vermilion oil field; 8, Lloydminster oil field; 9, Kinsella gas field; 10, Wainwright oil field; 11, Provost gas discovery; 12, Princess oil and gas field; 13, Eyremore wildcat area; 14, Taber oil field; 15, Conrad oil field; 16, Pendant d'Oreille gas discovery.

in the Devonian limestone which contained water. The well was plugged back to discover oil in a porous zone at the top of the Madison limestone which produced 25 barrels a day of water-cut oil. South Princess Syndicate No. 3 extended the new pool 1½ miles on the north. This well, which is rated as the most successful Madison completion yet drilled on the plains, is capable of making from 50 to 198 barrels of water-free oil per day under different operating chokes and pressures.

Princess Brooks No. 1 made a new gas discovery 7 miles northeast of the town of Brooks. The well showed 23,000,000 cubic feet daily from the Sunburst sand of the Lower Cretaceous at a depth of 3,278–3,288 feet. A second well was abandoned after failing to find the Sunburst sand present.

Foremost.—McColl-Frontenac discovered the Pendant d'Oreille gas field south of Pakowki Lake and 20 miles southeast of the Foremost gas field. The discovery well No. 9A made 46,000,000 cubic feet of gas daily from the Bow Island sand through perforations from 2,013 to 2,046 feet and 2,153 to 2,180 feet. Six exploratory wells followed the discovery well; 3 were completed as gas wells having an average flow of 9,000,000 cubic feet daily, and 3 were abandoned as unproductive.

Eyremore.—The Sun Oil Company drilled its first well in Alberta, Sun C.P.R. No. 1, on a seismic anomaly to the depth of 4,894 feet. The well was abandoned after finding salt water in the Devonian dolomite.

Taber.—The West Taber field was further extended with the completion of 2 oil wells at the south end of the field. Standard Nassau Taber Province 65-15A flowed initially at the rate of 135 barrels per day to make it the best well in the field. December production from the field averaged 528 barrels per day.

Conrad.—Conrad Province 57-33B extended the field ¼ mile east when it initially pumped 42 barrels of 26° A.P.I. oil daily. December production from this field averaged 480 barrels per day.

Vermilion.—Saskahead No. 1, when completed in 1942, was considered a failure. The well was worked over in 1946 to extend the field a ½ mile northeast which should open new locations. The well produces from 25 to 30 barrels of 14° A.P.I. oil per day. December production from the field averaged 469 barrels per day.

ATHABASKA BITUMINOUS SANDS

Drilling of the bituminous sands of Northern Alberta has been done by the Dominion Government as part of a program of wartime investigation which included the operation near Fort McMurray of the Abasand mining and extraction plant. Drilling from 1942 until 1947 has been done in several selected areas and a rich deposit of bituminous sands covering about 3 square miles has been discovered in the Mildred-Ruth Lakes area, 22 miles north of Fort McMurray on the west side of the Athabaska River. The bituminous sand area is under light overburden and has a maximum thickness of 249 feet. It is highly variable in quality but part of it is high grade and contains bitumen beds from a few inches to 21

feet thick interstratified with the sands. The bitumen beds vary in petroliferous content to the maximum of about 83 per cent by weight. The specific gravity of the material is 1.01, which is practically the same as bitumen separated from the sands. The greatest aggregate thickness of bitumen beds in any one hole is 57 feet but the number of beds ranges to the maximum of 17 in 2 holes. Seventy-three holes have been completed and, in nearly all of these, the underlying Devonian limestone was reached at depths ranging from 130 to 300 feet.

According to G. S. Hume,[4] the amount of bitumen in the deposit within 3 square miles probably exceeds 500,000,000 barrels. In 120 acres close to a good site for an extraction and refining plant where there is an adequate tailings disposal area, the bituminous sands have an average thickness of 188 feet under 47 feet of overburden. Several holes within this area have penetrated bitumen beds which in 1 hole have an aggregate thickness of 48 feet. The 120 acres which comprise only a small part of the total deposit are estimated by Hume to contain about 52,000,000 barrels of bitumen, sufficient for a 10,000-barrel per day refining plant for 15 years. There is no doubt, therefore, that the Mildred-Ruth Lakes deposit contains sufficient bitumen to warrant an economic study of the feasibility of carrying on commercial operations.

LLOYDMINSTER—ALBERTA AND SASKATCHEWAN

The Lloydminster oil field which straddles the border of Alberta and Saskatchewan so increased in production during 1946 that it is now ranked as a major oil field. Its daily potential production of approximately 2,000 barrels a day of 14° A.P.I. oil is partly shut in due to the limited market for the oil. The field was extended 5 miles northwestward with the successful completion of an outpost well, Lloydminster Oil Producers No. 3, which initially produced 65 barrels of net oil from the Sparky sand of the Lower Cretaceous.

The Silverdale pool was extended south and northeast during the year by the drilling of 30 development wells. The initial production of the wells is 40–60 barrels per day which declines fairly rapidly during the first few months before levelling off to about 30 barrels.

The exploratory wells, Husky Oil and Gas Development Nos. 3 and 4, and Withers Lone Rock No. 1, extended the field 14 miles southeast in Saskatchewan. The wells have not yet been placed on pump but prolonged bailing tests indicate that 50-barrel wells can be developed at this end of the field. Two intervening outpost wells, Northeast Syndicate D.B. No. 1 and Withers Groat Furness No. 1 between Lone Rock and the Silverdale pool, have not yet been pumped but both appear to be commercial-sized wells from the drill-stem and bailing tests. The oil at the southeast end of the field is of slightly better grade, being 17.5° A.P.I.

A total of 36 development wells and 22 exploration wells were drilled during the year, of which 3 can be considered as new pool discoveries.

[4] Personal communication.

The 1946 production for the field amounted to 213,041 barrels which is the bulk of the field's cumulative production of 270,026 barrels. Actual daily average for the last 4 months of 1946 was 965 barrels from 47 wells.

SASKATCHEWAN

In all, 54 wells of all types were completed in Saskatchewan, making a total footage of 116,540 feet; of these, 25 wells are classified as exploratory with a footage of 62,228 feet. These footages given an average depth of 2,158 feet for all types of wells compared with 2,491 feet for exploratory wells. The average depths are very low because most of the exploration is confined to the Lloydminster area where the producing formations are the Lower Cretaceous at depths of 2,000 feet or less.

Vera-Unity area.—In western Saskatchewan, Verbata Gas and Oil No. 2 found 875,000 cubic feet of gas per day from 1,575–1,624 feet in an Upper Cretaceous sand, probably equivalent to the Viking zone of Provost and Kinsella. The well was drilled to 4,490 feet after finding 435 feet of salt in the Silurian.

NORTHWEST TERRITORIES

Imperial Oil Limited drilled 2 unsuccessful wildcat wells in the Mackenzie River area. Imperial Redstone No. 1 was drilled to 4,874 feet to finish in Silurian dolomite. Whirlpool No. 1 was drilled on a large surface structure which was checked by a seismic survey. The well was completed at 6,417 feet in a repetition of Devonian limestone.

The Norman Wells field produced 181,408 barrels of oil in 1946, comparable with 353,099 barrels in 1945. Part of the 1945 production was run through the Canol pipe line to Whitehorse, which accounts for the higher figure. The 1946 production was almost entirely absorbed by the mining industry centered on Great Bear and Great Slave lakes. Six geological parties and 1 seismic party worked for part of the year in Northwest Territories.

GEOLOGICAL AND GEOPHYSICAL SURVEYS

Various oil companies employed 25 surface geological parties in Alberta, Saskatchewan, British Columbia, and Northwest Territories during 1946. Considerable core-drilling was also done in central Alberta which, together with the surface work, totals 150 geological party-months for the year.

Seismograph surveys were on the increase in 1946 when 9 parties accounted for an estimate of 100 party-months. A predominance of the coverage was on the central Alberta plains.

ONTARIO

Approximately 450 wells were completed in Ontario, most of which were step-out wells in the gas-producing areas of Kent and Lambton counties and the Niagara Peninsula. Approximately 50 wells were drilled in search of shallow

Devonian oil from depths of 400 to 700 feet, 25 wells prospected for oil or gas in the Salina-Guelph formations of Silurian age, and 6 wildcats were drilled into the Ordovician Trenton formation.

As a result of the exploratory drilling, the Becher oil and gas field was discovered 4 miles north of Wallaceburg by Imperial Oil Limited. Six gas wells in the field have a potential open flow of 5,000,000 cubic feet per day, and 1 flowing oil well produces 20–25 barrels per day from the Salina-Guelph formations at depths ranging from 1,850 to 1,950 feet. The proved areas of the Camden Gore gas field and the Zone gas field were extended.

Most of the exploratory drilling in southwestern Ontario is based on subsurface studies of previously drilled wells augmented by some core-drilling. There are many known structures in the area, a large proportion of which produce gas in commercial volume when porous zones are found in the limestone and dolomite which make up most of the Paleozoic section. The province produces about 350 barrels of oil a day and this from innumerable wells, many of which have been operated for more than 20 years.

QUEBEC

Exploration in Quebec was confined to the Gaspé Peninsula where geological surveys were made and some drilling was done. No wells were completed during the year. At the year's end, Continental Petroleum No. 1 well on Galt Brook was at a depth of 2,137 feet in the Devonian Grand Greve limestone, and Gaspé Oil Ventures No. 1 was also drilling in the Devonian limestone at 1,780 feet.

NEW BRUNSWICK

There were no exploratory wells drilled in the province during 1946, although some geological and geophysical surveys were made in southern New Brunswick. Two gas wells were completed in the Stoney Creek field.

NOVA SCOTIA

During the year the Sun Oil Company commenced drilling a second well on the Minudie anticline a few miles south of Amherst. In December the well was drilling below 7,500 feet in Mississippian beds, presumably of the Upper Albert series.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 31, NO. 6 (JUNE, 1947), PP. 959-978, 4 FIGS.

DEVELOPMENTS IN APPALACHIAN AREA IN 1946[1]

APPALACHIAN GEOLOGICAL SOCIETY[2]
Charleston, West Virginia

ABSTRACT

NEW YORK. In the Oriskany gas area 26 wells were completed or drilling in 1946 as compared with 36 in 1945. There were no new discoveries. Three producers were drilled in the South Addison pool with a total open flow of 9,927 MCF.

Table I is a representative sample log of an Oriskany well.

Figure 1 shows the Oriskany fields and drilling in 1946.

Table II gives the records of deep drilling in the New York state area.

Fifteen wells were drilled to the Medina sand, the producers making about 2,000 MCF.

In the oil-producing area completions increased from 1,349 in 1945 to 1,739 in 1946 and the daily average production increased from 12,402 barrels per day in 1945 to 12,828 barrels per day in 1946.

There was only a small amount of wildcatting in 1946. Exploration geological work was slight and there were no geophysical surveys.

PENNSYLVANIA. A decline of 8 per cent occurred in the total number of wells completed in the shallow-sand territory of western Pennsylvania (Upper Devonian or higher) during 1946 as compared with 1945. The Coryville oil pool in northeastern McKean County, discovered in 1945, was the scene of greatest drilling activity outside the Bradford field. A slight increase in drilling occurred in the Bradford field and production increased 4.3 per cent as compared with 1945. The small Gordon sand oil pool in North Strabane Township, Washington County, opened in 1945, was extended somewhat. Oil production in the middle and southwestern districts of Pennsylvania increased 6 per cent as compared with 1945. The recently opened Haskell sand gas pool, south of the Bradford oil pool in McKean County, was the most active of the shallow-sand gas pools.

Fourteen deep wells (Onondaga or deeper) were completed in 1946. Six of these were gas wells, one was drilled for gas storage, and 7 were dry holes. Three of the gas wells opened new pools.

OHIO. Twelve hundred and ninety-three completions were listed in Ohio. Of these 408 or 31½ per cent were dry, 547 were gas wells and 338 were oil wells.

Two hundred and three wells tested the sands above the Berea, 281 penetrated the Berea, 14 were drilled into the Ohio shale of Devonian age, 40 were drilled as Oriskany tests, and 695 were drilled through the Clinton sand.

The activity in the Clinton sand, the most important in the state, centered around the Canton Clinton gas field. There were 132 wells drilled in this area with an average open flow of 2,500 MCF. Muskingum and Perry counties remained active.

The Oriskany sand activity centered in Columbiana County. Although the open flows exceeded 2,000 MCF with rock pressures of over 1,700 pounds, the rapid depletion and the encroachment of water is discouraging.

Little activity is reported in the Trenton fields in northwestern Ohio where 18 wells were drilled with completions of 6 oil wells, 3 gas wells, and 9 dry holes.

There were 5 sub-Trenton tests drilled in the state, four were in Lorain County, of which 3 were dry, but one made 67 MCF of gas from the St. Peter horizon at 4,125 feet. The other sub-Trenton test, which was the deepest well drilled in the state during 1946 was in Muskingum County. This well encountered a small flow of gas from dolomite at 6,558 feet, but drilled into water at a depth of 6,704 feet.

WEST VIRGINIA. Outstanding are the continued successful development of natural gas in Wyoming and Nicholas counties from the shallow sands down to and including the Berea sand, and the completion of a Huntersville chert gas well in Preston County.

A second well producing gas in the Huntersville chert and the Oriskany sand was completed in

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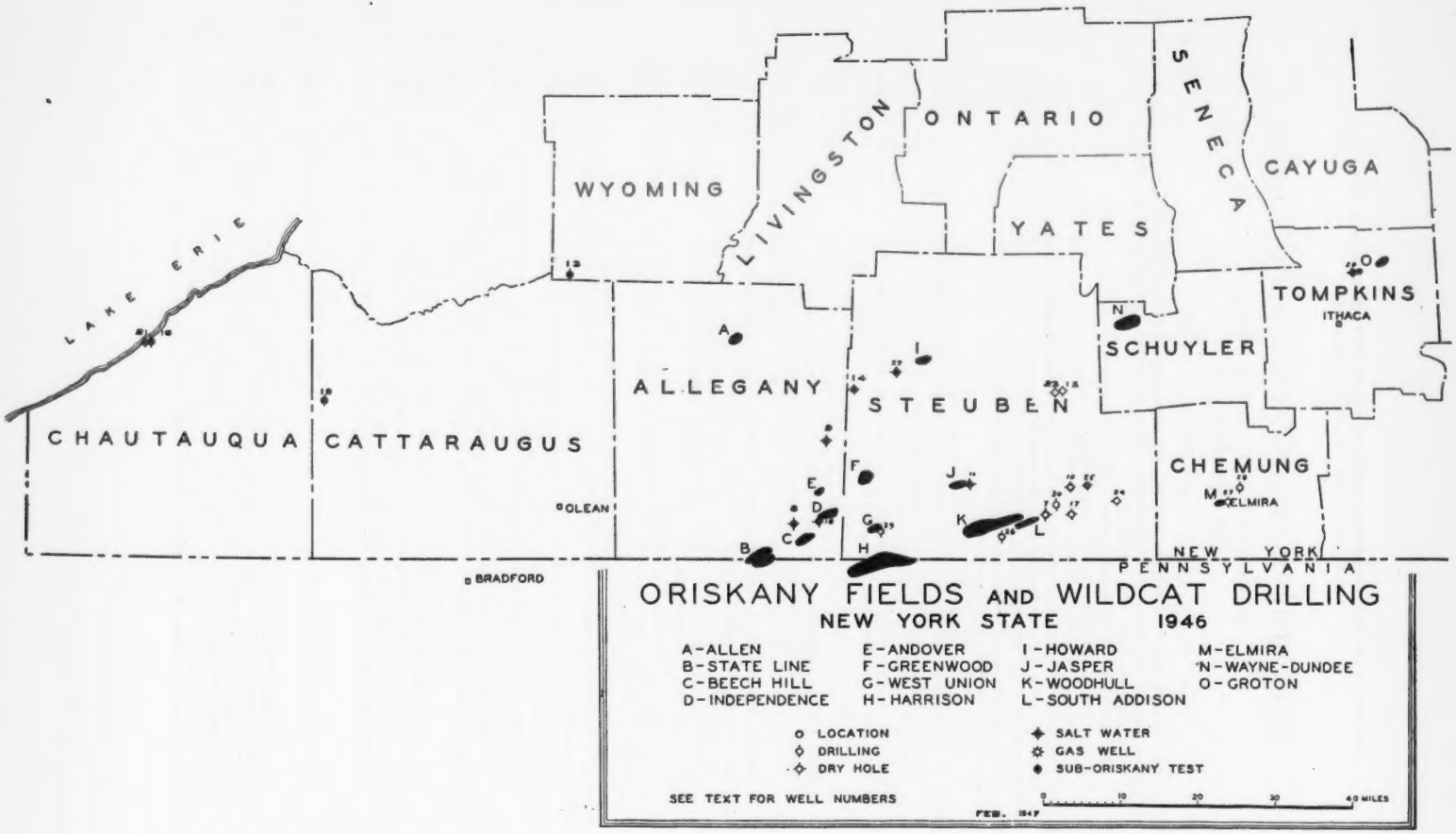
LAKE ERIE
WYOMING
LIVINGSTON
ONTARIO
SENECA
CAYUGA
YATES
TOMPKINS
ITHACA
SCHUYLER
ALLEGANY
STEUBEN
CHAUTAUQUA
CATTARAUGUS
CHEMUNG
ELMIRA
OLEAN
BRADFORD
NEW YORK
PENNSYLVANIA
ORISKANY FIELDS AND WILDCAT DRILLING
NEW YORK STATE 1946
A-ALLEN
B-STATE LINE
C-BEECH HILL
D-INDEPENDENCE
E-ANDOVER
F-GREENWOOD
G-WEST UNION
H-HARRISON
I-HOWARD
J-JASPER
K-WOODHULL
L-SOUTH ADDISON
M-ELMIRA
N-WAYNE-DUNDEE
O-GROTON
LOCATION
DRILLING
DRY HOLE
SALT WATER
GAS WELL
SUB-ORISKANY TEST
SEE TEXT FOR WELL NUMBERS
0 10 20 30 40 MILES
FEB. 1947

FIG. 1

Tucker County, and the rotary test in Greenbrier County is proceeding downward toward the Oriskany and Clinton horizons.

Rate of drilling is somewhat less than 1945, but rate of abandonments of both oil and gas wells has increased. No new gas pools of importance have been discovered aside from the single completion in Preston County. A slight extension of the Big Lime oil pool in northern Kanawha County was made and a single "Big Lime" oil well was completed in western Logan County.

KENTUCKY. Exploratory drilling in Kentucky in 1946 involved the testing of beds from Pennsylvanian to Cambrian. Successful new-field wildcats were confined to the Mississippian of western Kentucky and the Upper and Middle Ordovician of south-central Kentucky. There were 4 Knox tests of note, one of which penetrated the Cambrian and stopped in porphyritic rhyolite. More tests to these older formations probably will be drilled in 1947.

NEW YORK

Oriskany gas area (Allegany, Steuben, Chemung, and Tompkins counties).—During 1946 there were 26 wells in operation in the Oriskany sand area as compared with 36 in 1945. Of the 26 wells only 3 were completed as gas producers with a total open flow of 9,927 MCF. All of the producers were drilled in the South Addison field designated on the map (Fig. 1) as L. Eleven of the remaining wells made salt water, 7 were dry holes and 5 were still drilling at the end of 1946. Ten of the completions were in wildcat areas and none of these produced commercially. A representative sample log of an Oriskany wildcat is here shown. Records of 1946 deep wells are shown in Table I. Map numbers 1, 2, 3, 4, 5, 6, and 12 are in the South Addison pool and are grouped on the map as L.

The 21 completed wells reached the Oriskany at an average depth of 3,825 feet, and drilled a total footage of 97,000 feet. The average cost per foot of hole drilled including materials and labor amounted to about $4.

Total gas production from Oriskany fields for the year was 2,231,000 MCF, a decrease of 4,709,000 MCF from 1945. Total gas production from Oriskany sand since the original discovery amounts to about 143 billion cubic feet.

Medina sand area (Cattaraugus, Chautauqua, and Erie counties.—In Erie County 12 wells were drilled to the Medina sand, of which 2 were considered to have too small an open flow to be producers. The total open flow from the other 10 wells amounted to 2,000 MCF. The rock pressures varied from 175 pounds to 600 pounds per square inch.

Chautauqua County had one producer (map, 16), and one dry hole (map, 21).

In Cattaraugus County one well was drilled as an extension. It had an open flow of 175 MCF.

Miscellaneous.—In Arcade Township, Wyoming County, the well on the Wilson Farm was completed as a dry hole at 7,144 feet. During 1946 only 387 feet were drilled, mostly due to shut-down time, waiting for cables. Part of the log of this well is summarized as follows.[3]

[3] From 1,750 to 6,720 feet the samples were examined by C. A. Hartnagel, former New York, State geologist. The Warrior limestone from 7,134 to 7,144 feet was tentatively identified by P. D. Krynine of the Pennsylvania State College, on the basis of chert which contained volcanic ash.

Formation	*Feet*	*Formation*	*Feet*
Tully limestone	1,750–1,769	Clinton sandstone	3,118–3,144
Onondaga limestone	2,145–2,274	Red Medina sandstone	3,290–3,346
Oriskany sandstone	Reported missing	White Medina	3,346–3,365
Helderberg limestone	2,274–2,330	Trenton limestone	5,265–6,193
White limestone	2,330–2,370	Little Falls dolomite	6,193–6,566
Salt	2,760–2,777	Potsdam sandstone	6,566–7,143?
Niagara limestone	2,925	Warrior limestone	7,135–7,144 (Middle Cambrian)

TABLE I

Deep Drilling in New York State in 1946

(Elevations and depths are in feet)

County	Township	Operator	Farm	Well Map No.	Elev. (Feet)	Tully	Onondaga	Oriskany	White Medina	Total Depth	Result	Class
Allegany	Alfred	Empire	Cy Rennels	9	1,833	3,385–3,430	4,001–4,047	4,047		4,050	SW	WC
	Independence	Empire	Livermore	18	2,091	4,145–4,194	4,794–4,842	4,842		4,846	SW	Ext
	Willing	Empire	Seaver	8	2,057	4,138–4,190	4,734–4,777	4,777		4,783	SW	WC
Cattaraugus	Leon	App.	Ackler	19	1,409		2,338–2,525	2,525	3,604–3,616	3,652	175M	Ext
Chautauqua	Portland	App.	Howell	16	669				2,182–2,192	2,231	Gas	WC
	Portland	App.	Anderson	21	668		1,075		2,176–2,183	2,202	Dry	WC
Chemung	Elmira	AGC	Gregg	27	1,310					Drlg		Ext
	Horseheads	Smith	Hoover	28	1,612					Drlg		WC
Steuben	Addison	Landie et al.	Ackerson	30						Drlg		WC
	Bath	App.	State of N.Y. 1	15	1,134	2,304–2,349	2,591–2,614	2,614–2,630		2,650	Dry	WC
	Bath	App.	State of N.Y. 2	23	1,806	2,455–2,490	3,286–3,308	3,308–3,321		3,330	Dry	WC
	Cameron	NYSNG	Hubbard	11	1,700	3,460–3,504	4,225–4,251	4,251		4,260	SW	Ext
	Corning	Spencer H. D.	Marland	24	1,484	3,057–3,125	4,060–4,098	4,098		4,127	Dry	WC
	Erwin	Leiderbach et al.	Platt	26	1,152	2,521–2,566	3,558–3,665	3,665		3,670	SW	WC
	Erwin	AGC	Landers	10	1,453	2,845–2,897	3,711–3,745	3,745–3,780		3,807	Dry	WC
	Hornellsville	Empire	Gottschall	14	1,619	2,898–2,938	3,537–3,635	3,635		3,656	SW	WC
	Howard	Empire	McNaughton	22	1,547	2,633–2,666	3,294–3,338	3,338–3,348		3,372	Dry	WC
	Lindley	Lampier	Lampier	17	1,516	3,555–3,610	4,408–4,461	4,461		4,480	Dry	WC
	Tuscarora	Sylvania	W. Dininny	1*	1,316	3,195–3,250	4,034–4,069	4,069–4,089		4,090	2,696 M	Proved
	Tuscarora	AGC	Smith	2*	1,400	3,367–3,420	4,560–4,609	4,609		4,649	SW	Proved
	Tuscarora	Cunningham	A. Dininny	3*	1,161	3,047	3,886–3,917	3,917		3,936	1,481 M	Proved
	Tuscarora	Bryson & Rogers	Edwards	4*			4,112–4,146	4,146		4,154	5,750 M	Proved
	Tuscarora	Knute Evjen	Morris	12*	1,702	3,933–3,993	4,773–4,806	4,806		4,814	Dry	Proved
	Tuscarora	NYSNG	Lemunyan	7	1,005	2,905–2,958	3,748–3,796	3,796–3,824		3,838	Dry	Proved
	Tuscarora	AGC et al.	Williams	5*	1,065	2,995–3,052	3,843–3,889	3,889–3,914		3,914	SW	Proved
	Tuscarora	Rogers et al.	Easterbrook	6*	1,072	2,982–3,033	3,808–3,868	3,868–3,888		3,889	SW	Proved
	West Union	Kane	Johnson	29						Drlg		
	Woodhull	Cunningham	Holt	26	1,607	3,668–3,704				Drlg		
Tompkins	Lansing	App.	Bower	20	1,026	385– 444	1,572–1,719	1,719		1,723	SW	WC
Wyoming	Arcade	Wilson	Wilson	13	1,474	1,750–1,769	2,140	Absent	Sub-Trenton		Dry	WC

Key to operators: Empire—Empire Gas and Fuel Company, Ltd.
App—Appalachian Development Corporation
AGC—Allegany Gas Corporation
NYSNG—New York State Gas Corporation.
Spencer H. D.—Spencer Hill Development Corporation

Key to class: WC—Wildcat.
Ext—Extension.

* Listed as symbol L in Figure 1.

Oil-producing area (Allegany, Steuben, and Cattaraugus counties).—In all, 1,739 wells were drilled in the secondary-recovery areas of the Allegany field and the New York part of the Bradford field. This number represents an increase of about 390 over 1945. The daily average production from the New York fields was 12,828 barrels per day, an increase of 426 barrels per day over 1945. The daily average production of the Allegany field increased 305 barrels per day over 1945 and the New York part of the Bradford field had an increase of 121 barrels per day over 1945.

Wildcat oil wells.—Wildcat drilling for oil in 1946 was slight and did not open any oil pool of major importance.

One well drilled in the Town of Grove in Northern Allegany County failed to find any sand to a depth of 2,000 feet. This well was near several old holes which reportedly showed oil, but it is likely that the oil showings were from the dark shales which predominate in the section.

A showing of oil in a water well about 10 miles northwest of Cuba, New York, resulted in the drilling of several wells which have produced a few barrels of oil. The oil was found at a depth of about 240 feet. These wells are north of the famous Seneca Oil Spring at Cuba, which was the site of the first oil found in North America.

There was some wildcat activity at Busti, near Jamestown, but little information is available on this area.

There has been no geophysical, and very little geological, exploration in the oil or gas sections during 1946. The increased application of electric logging to oil-field-development wells during 1946 may be of great value, especially in broken sands where it is difficult to locate small shale sections for shot placement.

PENNSYLVANIA[4]

A small decline in drilling activity occurred in the shallow-sand territory of western Pennsylvania (Upper Devonian or higher) during 1946. In all, 3,631 wells was completed, as compared with 3,962 in 1945, a decrease of 8 per cent. Of these, 592 were gas wells, 203 were oil wells in new pools or extensions of old pools, 180 were dry holes, and 2,656 were drilled in connection with secondary-recovery operations. Fourteen deep wells (Middle Devonian or deeper) were completed in 1946. Six of these were gas wells, 1 was drilled for gas storage, and 7 were dry holes. Three of the gas wells opened new pools, at least one of which will probably be proved significant in size.

SHALLOW-SAND DEVELOPMENTS

During 1946, 975 wells were completed in the shallow-sand territory of western Pennsylvania, exclusive of new wells drilled in connection with second-

[4] Published by permission of the director of the Pennsylvania Geological Survey. In the preparation of this review, the writer acknowledges the cooperation of G. G. Bauer, George J. Donaldson, Jr. George C. Grow, Jr., William S. Lytle, D. T. Secor, and Wilbur H. Seifert, who contributed part of the data.

EMPIRE GAS AND FUEL COMPANY, LTD., ET AL.
MARSHALL MCNAUGHTON NO. 1
(Howard Township, Steuben County, New York)

Depth (Feet)	
184– 199	Medium gray shaly sandstone—sandy shale—tan sandstone
258	Coarse light gray very fine-grained sandstone—some green sandstone
272	Fine light gray fossiliferous sandstone—gray shale
287	Medium gray very fine-grained sandstone
295	Medium gray sandstone and shaly sandstone
374	Medium light gray very fine-grained sandstone—very fossiliferous at 374
434	Medium gray shaly sandstone and sandy shale
478	Medium gray shale and shaly sandstone
486	Medium gray shaly sandstone
554	Medium gray shale and shaly sandstone and sandy shale
750	Medium gray and light gray shaly sandstone and sandy shale
814	Coarse black shale—gray shale
833	Medium dark gray shale—some brownish sandstone
862	Medium gray shale and sandy shale—some brownish sandstone
1,050	Medium gray shale and sandy shale
1,075	Medium gray shale and sandy shale—some dark gray shale—more sandy
1,126	Medium light gray sandy shale and shale—some dark gray shale
1,167	Fine light gray shale—dark gray shale
1,193	Medium light gray shale and sandy shale
1,203	Medium gray shale
1,260	Medium light gray shale and sandy shale
1,278	Medium light gray shale and sandy shale—light gray very, very fine grained sandstone
1,315	Medium gray shale and sandy shale
1,325	Medium gray shale—dark gray shale
1,330	Medium light gray shale
1,387	Medium gray and light gray very, very fine-grained sandstone—dark gray shale
1,440	Medium gray shale and sandy shale
1,486	Medium dark gray shale and gray shale
1,506	Medium dark gray shale and gray shale
1,506	Medium gray shale—light gray very fine-grained sandstone
1,542	Medium gray shale and sandy shale
1,584	Medium gray and dark gray shale—fossils at 1,584
1,619	Medium light gray shaly sandstone
1,660	Medium light gray shaly sandstone—dark gray shale
1,761	Medium gray, light gray and dark gray shale
1,810	Fine light gray very, very fine-grained sandstone—black shale
1,886	Medium light gray shale
1,896	Medium light gray and dark gray shale
1,921	Medium black shale
2,076	Medium gray shale
2,229	Medium black shale
2,240	Medium black shale—some light gray shale
2,254	Medium dark gray shale
2,304	Medium gray shale
2,312	Medium dark gray shale
2,[illegible]94	Medium very dark gray shale
2,559	Medium black shale
2,567	Medium black shale—some brown limy pieces
2,623	Medium black shale
2,666	Medium brown limestone—TULLY LIMESTONE, 2,623–2,666
2,783	Medium dull gray shale—Gas pocket at 2,762
2,794	Fine gray shale and grayish brown limestone
29,48	Medium dark gray to black shale
2,957	Medium light brownish gray limestone and white limestone—black shale
2,988	Medium dark gray and black shale
2,998	Fine grayish brown and white limestone—black shale
3,268	Medium black shale—some limy pieces 3,166–3,205
3,276	Fine brown and grayish brown limestone—black shale
3,294	Fine black shale—some brown limestone—gas pocket
3,302	Medium brown, gray and oyster gray limestone—black shale TOP ONONDAGA LIMESTONE, 3,294
3,310	Fine light dull gray limestone—oyster gray limestone Cased at 3,310
3,338	Fine gray, light gray and brownish gray limestone
3,339	Fine clear sandstone—glauconite
3,348	Fine sand grains—Oriskany sandstone 3,338–3,348—No gas or water
3,350½	Medium dark brown, gray limestone and white limestone
3,357½	Fine brown limestone—some oyster-gray limestone
3,368	Fine brown and light gray limestone (dolomite?)
3,374	Fine bluish gray dolomite or waterlime (?) some brown limestone. Total depth.

Some gas when well completed—12 pound rock pressure in 19 hours—probably from Oriskany.

ary-recovery operations. Of the shallow wells, 61 per cent were gas wells, 21 per cent were oil wells, and 18 per cent were dry holes. The 592 new gas wells had a total initial open-flow capacity of 128,811,000 cubic feet per day, as compared with the total initial open-flow capacity of 148,662,000 cubic feet of the 520 new gas wells completed in 1945. The 203 new oil wells had a total initial production of 1,680 barrels per day.

Southwestern Pennsylvania.—Shallow-well completions in southwestern Pennsylvania are shown in Table II. The 287 new gas wells had a total initial open-flow capacity of 63,991,000 cubic feet per day. New small gas pools were discovered, as follows: one in Harmar Township, Allegheny County, and one each in Perry and Redstone townships, Fayette County.

TABLE II

SHALLOW-WELL COMPLETIONS IN SOUTHWESTERN PENNSYLVANIA GAS AND OIL FIELDS IN 1946

County	*Completions*		*Gas*		*Oil*				*Dry*	
	Number of Wells	*Average Total Depth (Feet)*	*Number of Wells*	*Average Initial Open-Flow (M. Cu. Ft. Per Day)*	*Average Total Depth (Feet)*	*Number of Wells*	*Average Initial Production (Bbls. Per Day)*	*Average Total Depth (Feet)*	*Number of Wells*	*Average Total Depth (Feet)*
Allegheny	28	2,515	16	591	2,185	2	16	2,631	10	2,859
Armstrong	132	2,852	114	110	2,827	0	—	—	18	3,010
Beaver	1	1,350	0	—	—	1	4	1,350	—	—
Butler	47	1,949	25	105	2,638	12	1	1,450	10	1,501
Fayette	36	2,490	22	839	2,449	0	—	—	14	2,553
Greene	46	2,666	32	206	2,687	3	10	2,660	11	2,607
Indiana	38	3,229	28	160	3,170	0	—	—	10	3,395
Washington	61	2,398	34	231	2,233	16	49	2,447	11	2,835
Westmoreland	26	3,380	16	121	3,273	0	—	—	10	3,549
Total	415	2,672	287	223	2,700	34	25	2,093	94	2,796

The 34 new oil wells in southwestern Pennsylvania had a total initial production of 860 barrels per day. The Young pool in North Strabane Township, Washington County, opened in May, 1945, was the scene of greatest activity. Thirteen oil wells in the Gordon sand had been completed at the close of 1946. Average daily production was about 110 barrels and the total production at the close of the year was approximately 49,000 barrels. The developed area now includes 390 acres, with good possibilities of further extension toward the northeast.

Northern and Middle districts.—A summary of activities in the shallow-sand territory of the northern and middle districts during 1946 is given in Table III. The 305 new gas wells had a total initial open-flow capacity of 64,820,000 cubic feet per day. Small new gas pools were discovered in Polk and Winslow townships, Jefferson County, and Genesee, Keating, Oswayo, Pleasant Valley, and West Branch townships, Potter County.

Development of the Haskell sand gas pool in Hamlin and Lafayette townships, McKean County, opened in 1945, continued throughout 1946. The pool now includes an area of 3,125 acres, and probably will not be greatly extended

as it is surrounded by dry holes. At present, there are 58 producing wells. The 26 wells drilled during 1946 had initial open-flow capacities ranging from 50,000 to 2,900,000 cubic feet per day, the average being 1,130,000 cubic feet.

Outside the Bradford field, the Coryville oil pool in the northeastern part of McKean County, discovered in 1945, was the scene of greatest drilling activity in Pennsylvania during 1946. Oil is produced from the Haskell sand, which is about 400 feet below the top of the Bradford Third sand. The pool, as now developed, includes approximately 1,800 acres and 155 oil wells have been completed in it. A number of the wells have had initial productions of 25–30 barrels per day,

TABLE III

SHALLOW-WELL COMPLETIONS IN NORTHERN AND MIDDLE PENNSYLVANIA GAS AND OIL FIELDS IN 1946

County	Completions		Gas			Oil*			Dry	
	Number of Wells	Average Total Depth (Feet)	Number of Wells	Average Initial Open-Flow (M. Cu. Ft. Per Day)	Average Total Depth (Feet)	Number of Wells	Average Initial Production (Bbls. Per Day)	Average Total Depth (Feet)	Number of Wells	Average Total Depth (Feet)
Clarion	50	2,408	47	57	2,396	1	10	2,513	8	2,470
Clearfield	6	3,369	0	—	—	0	—	—	6	3,369
Crawford	1	600	0	—	—	0	—	—	1	600
Elk	24	2,430	17	185	2,329	0	—	—	7	2,675
Forest	19	2,155	14	121	2,148	0	—	—	5	2,175
Jefferson	113	2,746	94	104	2,682	0	—	—	19	3,063
McKean	293	1,884	100	454	2,046	166	5	1,748	27	2,123
Mercer	10	828	5	250	729	0	—	—	5	927
Potter	18	1,961	18	25	1,961	0	—	—	0	—
Venango	18	1,461	9	63	1,797	2	1	1,089	7	1,134
Warren	8	1,542	7	28	1,534	0	—	—	1	1,600
Total	560	2,116	305	213	2,264	169	5	1,744	86	2,324

* Does not include wells drilled in connection with secondary-recovery operations.

but most of them quickly settle to 2–15 barrels on the pump and some of the marginal wells to less than one barrel. The average daily production of the pool at the close of 1946 was reported to be 800 barrels. In all, 191 wells were drilled in northeastern McKean County in connection with the Coryville development, 163 of which were oil wells, 23 were gas wells, and 5 were dry holes.

A small Cooper sand oil pool was opened in the vicinity of Morrison in western McKean County in 1946. Three oil wells, about 600 feet apart, which soon settled to 2–3 barrels per day, were completed along a northeast-southwest trend. Four recent dry holes and other earlier holes still leave room for some extension of the pool toward the north.

In the Bradford field, 2,503 new wells were drilled, about half of which were water-intake wells, as compared with 2,351 in 1945, an increase of 6.5 per cent. Oil production in this field, about 86 per cent of whose area lies in Pennsylvania, increased from a daily average of 30,881 barrels in 1945 to 32,209 barrels in 1946, or 4.3 per cent. Of the new wells, 2,153 were located in the Pennsylvania part of the field and this part contributed 29,452 barrels of the daily average production.

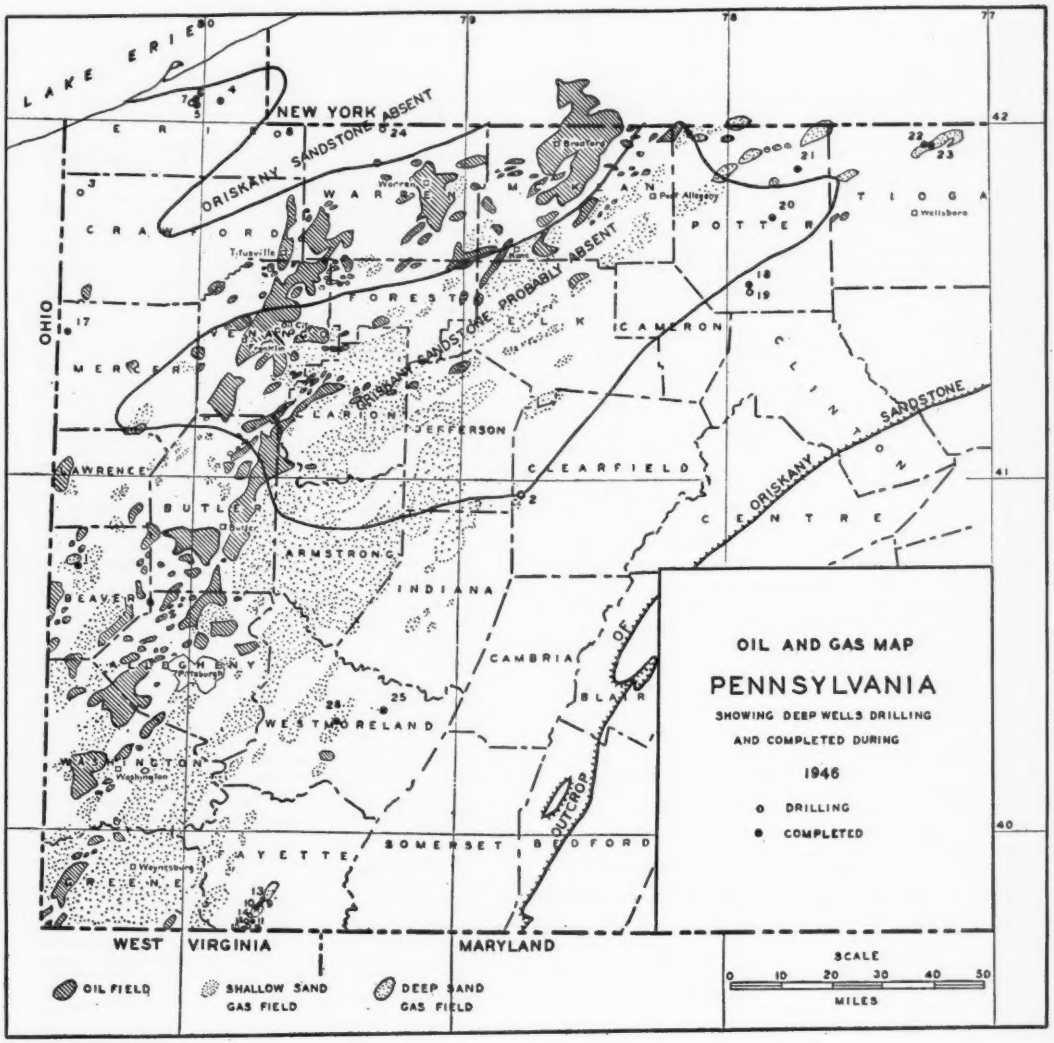
LAKE ERIE
NEW YORK ABSENT
ORISKANY SANDSTONE
ORISKANY SANDSTONE PROBABLY ABSENT
ORISKANY SANDSTONE
OHIO
ERIE
CRAWFORD
WARREN
MCKEAN
POTTER
TIOGA
MERCER
VENANGO
FOREST
ELK
CAMERON
CLARION
JEFFERSON
CLEARFIELD
CLINTON
LAWRENCE
BUTLER
ARMSTRONG
CENTRE
INDIANA
BEAVER
ALLEGHENY
CAMBRIA
BLAIR
WESTMORELAND
WASHINGTON
FAYETTE
SOMERSET
BEDFORD
GREENE
OUTCROP
WEST VIRGINIA
MARYLAND
OIL AND GAS MAP
PENNSYLVANIA
SHOWING DEEP WELLS DRILLING
AND COMPLETED DURING
1946
DRILLING
COMPLETED
SCALE
0 10 20 30 40 50
MILES
OIL FIELD
SHALLOW SAND GAS FIELD
DEEP SAND GAS FIELD

FIG. 2

TABLE IV

DEEP TESTS COMPLETED AND DRILLING IN WESTERN PENNSYLVANIA IN 1946
(Elevations and depths are in feet)

Map No.	County	Township	Well	Company	Elevation above Sea-Level	Berea	Tully
1	Beaver	South Beaver	C. C. Kennedy 1	Beaver Hill Oil and Gas Co.	1,240	948–965	
2	Clearfield	Bell	Alice Irwin 10	F. C. Deemer	1,964		6,685–6,865
3	Crawford	Beaver	Wilbur J. Bittel 1	Appalachian Dev. Corp., et al.	1,036		
4	Erie	Greene	Alfred A. Holm 1	Appalachian Dev. Corp.	1,316		
5	Erie	Summit	Merle K. Meade 1	Appalachian Dev. Corp.	1,155		
6	Erie	Summit	Carl W. Held 1	Appalachian Dev. Corp.	1,149		
7	Erie	Summit	H. G. Hull 1	Sylvania Corp.	1,200		
8	Erie	Wayne	C. J. Follette 1	Pennsylvania Gas Company	1,835		
9	Fayette	Georges	Wm. R. Barton Estate 6	Manufacturers Light and Heat Company	2,613		6,520–6,616
10	Fayette	Georges	Wm. R. Barton Estate 7	Manufacturers Light Heat Company	2,437		6,402–6,535
11	Fayette	Georges	J. R. Smith Estate 1	New Penn Dev. Corp and Wm. E. Snee	2,526		6,490–6,570
12	Fayette	Georges	Mary I. Smith 2	New Penn Dev. Corp. and Wm. E. Snee	2,390		
13	Fayette	Georges	George Walters 2	Peoples Natural Gas Company	2,454		
14	Fayette	Georges	Jesse S. Eutsey 1	Manufacturers Light and Heat Company	2,290		
15	Fayette	Georges	George Steve 1	Manufacturers Light and Heat Company	2,542		
16	Fayette	Georges	Hartman 1	Peoples Natural Gas Company	2,354		
17	Mercer	West Salem	H. K. Smith 1	Homer Hart and W. H. Hickman	1,275	425–475	
18	Potter	East Fork	Emporium Lumber Company 9	Allegany Gas Co.	2,005		5,576–5,638
19	Potter	East Fork	Emporium Lumber Company 10	Allegany Gas Co.	1,915		5,454–
20	Potter	Ulysses	Lyman and Wynkoop 1	Sylvania Corp.	1,947		4,804–4,856
21	Potter	Ulysses	Earl Herrington 1	Acme Drilling Co.	2,300		4,802–4,852
22	Tioga	Farmington	J. A. Kemp 1	New York State Natural Gas Co.	1,684		3,055–3,115
23	Tioga	Lawrence	George Colgrove 1	New York State Natural Gas Co.	1,386		2,732–2,793
24	Warren	Sugar Grove	Anderson 1	T. M. Pettigrew, et al.	1,352		
25	Westmoreland	Derry	Camilla F. Giffin 3	Peoples Natural Gas Company	1,617		6,332–6,375
26	Westmoreland	Unity	L. C. Steiner 5	American Locomotive Company	1,463		7,250–7,274

Onondaga	Oriskany	Lockport	Medina	Total Depth	Date Completed	Results
4,708				4,742	3- 6-46	Abandoned in Onondaga, dry hole
7,424–7,503	7,503–7,505					Drilling at 7,634 feet
2,148–2,405	2,405–2,413					Shut down at 3,327 feet. 15,000 cu. ft. gas per day at 2,407. 6 bbls. salt water per hour at 2,408. Black water at 3,225–3,240
2,290–2,563	2,563–2,582			2,582	4- 9-46	Showing of gas at 700 and 840. 1,650 feet salt water at 2,571 in Oriskany
2,023–2,167	2,281–2,291			2,291	8-23-46	420,000 cu. ft. gas in Oriskany. Rock pressure 825 pounds. Small amount salt water at 2,290
2,039–2,280	2,280–2,300			2,302	12-21-46	1,200 feet salt water in 3½ hours from Oriskany
2,084–2,329	2,329–2,336½			2,336½	1- 7-47	1,435,000 cu. ft. gas at 2,333–2,336½ in Oriskany. R. P. 800 pounds. Drilling at close of 1946
3,185						Drilling
7,172–7,425 Top chert 7,201	7,425–7,470			7,495	6-22-46	Total initial open flow 3,000,000 cu. ft. gas. Gas at 7,231–7,278. R.P. 2,500 pounds
7,359– Top chert 7,401				7,476	8-21-46	Total initial open flow 1,500,000 cu. ft. gas at 7,418. R.P. 2,700 pounds
7,047– Top chert 7,062				7,063	9-30-46	Initial open flow 32,000,000 cu. ft. gas at top of chert
						Drilling at 2,798
						Drilling at 6,578
						Drilling at 5,090
						Drilling at 640
						Drilling
3,188–3,420	3,420–3,430		Red 4,765– White 4,795–4,865	4,961	5-13-46	Water at 3,425 feet rose 1,700 feet. Showing gas a 4,753–4,763 and 4,828. Showing oil at 4,782 and 4,833
6,324–6,328	6,328–6,348			6,375	7-13-46	Initial open flow 115,000 cu. ft.
6,183–6,194	6,194–					198,000 cu. ft. gas at 6,201. 900,000 cu. ft. gas at 6,208. Drilling at close of year
5,486–5,518	absent			5,685	1-31-46	Dry
5,536–5,563	5,563–5,582			5,591	10-30-46	Dry
3,963–3,986	3,986–			4,404	9-16-46	Drilled for gas storage
3,659–3,687	3,687–			3,702	1-11-47	Drilled for gas storage
3,038–3,117	absent					Black water at 3,974 rose 3,200 feet in hole. Shut down at 4,222
7,040–7,230 Top chert 7,073	7,230–7,290			8,174	7-31-46	Dry
7,784–8,005 Top chert 7,810	8,005–8,043			8,625	8-25-46	Oriskany shot 8,004–8,020. Initial open flow, upper sand, 85,940 cu. ft. gas. Inital open flow, Oriskany, 156,830 cu. ft. gas

In the Kane-Clarendon area of southwestern McKean County and eastern Warren County, 171 wells were completed in 1946, mostly in connection with water-flooding projects. In the Venango district, 127 air-intake and 205 oil wells were drilled, as compared with 283 and 354, respectively, in 1945, a decrease of 48 per cent. Oil production in the middle and southwestern districts of Pennsylvania increased from a daily average of 6,527 barrels in 1945 to 6,931 barrels in 1946, or 6 per cent.

DEEP-SAND DEVELOPMENTS

The results of deep drilling in western Pennsylvania during 1946 are summarized in Table IV. Of the fourteen wells completed, 6 were gas wells, 1 was drilled for gas storage, and 7 were dry holes. Three of the gas wells opened new pools.

The Merle K. Meade well No. 1 in Summit Township, Erie County, opened a new Oriskany sand pool. The H. G. Hull No. 1, completed early in 1947, is the second sucessful well in the pool. The Oriskany sandstone wedges out updip toward the north, but a slight reversal in dip occurs at the site of the pool. The top of the sand was encountered 5 feet lower in the Carl W. Held well, 0.6 mile north of the discovery well. Only salt water was present in it here.

Two more gas wells were completed in the Barton pool of the Summit field along the Chestnut Ridge anticline in Fayette County. The J. R. Smith well, No. 1, 1.1 mile southwest of the southernmost of the Barton pool wells, is probably in a separate pool. The Smith well had an initial open flow in excess of 32,000,000 cubic feet of gas per day when the top of the Onondaga chert was tapped. Four additional wells were drilling in the Smith pool at the close of the year.

One additional gas well was completed in the East Fork Oriskany sand pool in southern Potter County in 1946 and one well was drilled for gas storage purposes in the Tioga field of Tioga County.

The L. C. Steiner well No. 5, on the Dry Ridge dome along the Fayette anticline in the central part of Westmoreland County, encountered a small flow of gas in the upper 4 feet of the Oriskany sandstone. The initial open flow, after the sand had been shot, was 156,000 cubic feet per day. This, at present, is the deepest producing well in Pennsylvania. The Camilla F. Giffin No. 3, on an elongate dome along the Chestnut Ridge anticline in the northeastern part of Westmoreland County, was dry in both the Onondaga chert and the Oriskany sandstone.

OHIO

Fifty-six per cent of all completions and 74 per cent of the footage drilled in Ohio during 1946 were in the Clinton fields. Of the 1,293 completions in all sands. 408 or 32½ per cent dry. The greatest activity was in and near the city of Canton where approximately one fourth of the 547 gas wells drilled during the year were completed in the Clinton sand. More than half of the volume of gas developed was in that area. One hundred thirty-two gas wells with an average initial open flow

of 2,500 MCF and average initial rock pressure of 1,240 pounds proved 12,000, acres in the immediate vicinity and in the city of Canton. A number of wells gauged between 6,000 MCF and 12,000 MCF.

In all, oil wells were completed in the Clinton sand. Of these, 66 were in Muskingum County and 45 in Perry County. The average initial production from Clinton oil wells was 27 barrels. The largest Clinton oil well, the Skinner No. 2 in Sec. 24, Hopewell Township, Perry County, flowed 187 barrels.

Of the 291 Berea completions, the greatest activity was in Meigs County where 15 gas wells and 60 oil wells were drilled.

In Oriskany fields 21 gas wells, 2 oil wells, and 17 dry holes were completed. The activity was centered chiefly in Columbiana County where several gas wells were completed with open-flow capacities in excess of 2,000 MCF and rock pressures of more than 1,700 pounds. However, the rapid depletion of these wells and water encroachment was very discouraging.

Four sub-Trenton tests were drilled in Lorain County. Three were dry but one gauged 67 MCF from the St. Peter at 4,215 feet.

The deepest well completed in the state during the year was the Industrial Gas Company's Whitmire No. 1 in Salt Creek Township, Muskingum County. A flow of gas from dolomite at 6,558 feet gauged 20 MCF but water was encountered at 6,704 feet.

There was no development of importance in the Trenton fields of western Ohio where 18 tests were completed.

All completions in the state are given by sands and counties in Table V.

West Virginia

The outstanding development in West Virginia in 1946, was the continued success in gas discoveries, in both the shallow and deep zones, far east of what has heretofore, been considered the east and southeast limits of production.

To illustrate this, the accompanying map of West Virginia (Fig. 3) shows the approximate eastward limits of the presently developed productive areas. In addition are shown the locations of the 1946 completion in Preston County, the second completion in Tucker County, and the test drilling in Greenbrier County which is intended to explore as far down as the Clinton formation.

The first of these, the J. S. Sisler well in Preston County, was completed in December, 1946, as a 4 million cubic-foot producer in the Huntersville chert at the depth of 5,622 feet. The second is well No. 2 on the Kuykendall tract in Tucker County which was completed in March, 1946, as a commerical producer. It tested about 4 million cubic feet in the Huntersville chert and the Oriskany sand at the depth of 8,410 feet.

These two wells and the Kuykendall No. 1 are, or will be, connected to pipeline outlets and, along with the Chestnut Ridge anticline production from the same zones but across the state line in Pennsylvania, make this part of the state a more promising area for exploratory drilling. The producing structure appears

TABLE V

Holes Drilled in Ohio in 1946 by Counties and Sands

	Shallow			*Berea*			*Ohio Shale*			*Orishany*			*Newbury*			*Clinton*			*Trenton*			*Sub-Trenton*			*Total*			*Grand Total*
	Oil	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	*Oil*	*Gas*	*Dry*	
Adams																					1						1	1
Ashland				9	5	4										1	31	29							10	36	33	79
Athens	9		6	3	5	7																			12	5	13	30
Belmont		1				1																				1	1	2
Butler																				1	1					1	1	2
Carroll												1						1									2	2
Columbiana				4		1				7	4						2								4	9	5	18
Coshocton						1				2						9	3	2							9	5	3	17
Cuyahoga										1			3					2								4	2	6
Darke																			2	1	1				2	1	1	4
Fairfield															1	1	2	4							1	2	5	8
Fulton																			1		3				1		3	4
Gallia																	2	1								2	1	3
Guernsey			4		4	8				5	2															9	14	23
Hocking		1			2	2										2	4	3							2	7	5	14
Holmes				1	3	1											14	14							1	17	15	33
Jackson		3			1													3								4	3	7
Knox				1	1	1				1						2	7	13							4	3	14	26
Lawrence		1					1										3	3								5	3	8
Licking				25	2	2	10		1							3	4	7							28	10	10	54
Logan																				1						1		1
Lorain																1	44	23				1	3		1	45	26	72
Lucas																					1					1		1
Mahoning										2	4															2	4	6
Medina				3													11	11							3	11	11	25
Meigs		1	2	60	15	10		1																	60	17	12	89
Mercer																			2		2				2		2	4
Monroe	42	11	26	3	15	12																			45	26	38	109
Morgan	2	3	10		4											1	13	13							3	20	23	46
Muskingum					3	1		1		4						66	42	28					1		66	50	30	146
Noble	6	4	7	2	6	17																			8	10	24	42
Perry				6	13	3										45	28	34							51	41	37	129
Portage																	3									3		3
Seneca																			1						1			
Stark																1	139	9							1	139	9	149
Summit												1	1				3	2								4	3	7
Trumbul												1						1							1		2	3
Tuscarawas		2		1	4	8						4					11	3							1	17	5	33
Vinton																	2	3								2	3	5
Washington	21	17	24		5	6																			21	22	30	73
Wayne													2				3	3								5	3	8
Total	80	44	79	118	88	85		13	1	2	21	17		6	1	132	371	212	6	3	9		1	4	338	547	408	1,293

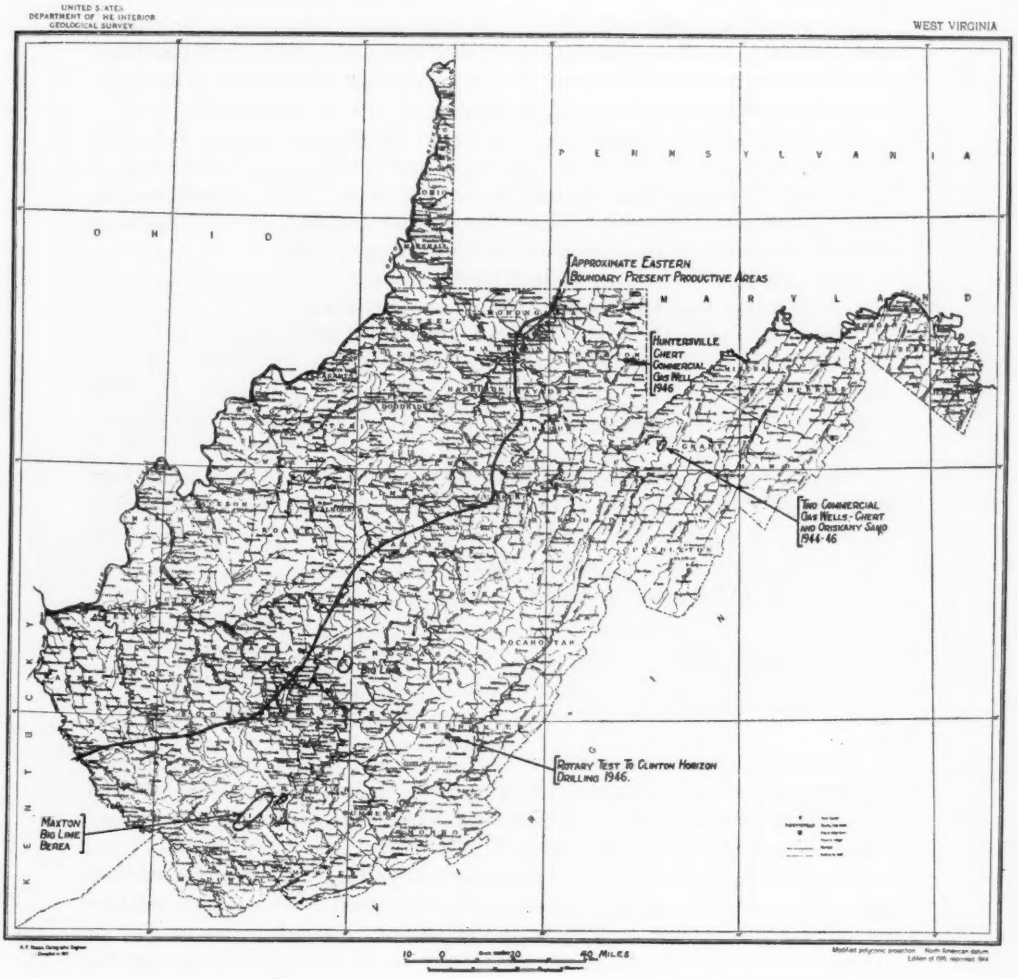
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WEST VIRGINIA
PENNSYLVANIA
OHIO
MARYLAND
KENTUCKY
Approximate Eastern Boundary Present Productive Areas
Huntersville Chert Commercial Gas Wells 1946
Two Commercial Gas Wells - Chert and Oriskany Sand 1944-46
Rotary Test To Clinton Horizon Drilling 1946.
Maxton Big Lime Berea
POCAHONTAS
10 0 20 40 MILES

FIG. 3

to be related to faulting. The substantial character of the oil, the high rock pressures, and fair open-flow volumes lend a measure of attraction despite the high drilling costs.

The Greenbrier County test is on the most pronounced anticline in the general area. It starts in the Pocono section and, unless difficulty prevents, will penetrate all formations through the Clinton. The first chance of production will probably be in the Huntersville chert or the Oriskany sand, directly underneath.

Shallower sand development has continued through the year in Wyoming County, with major success in the "Big lime" and the Berea sand. The substantial nature of this development and the amount of gas above ground may be better understood when it is realized that pipeline installations are being constructed to move 50 million cubic feet of gas northward daily.

The "Big lime" development in Nicholas County continues also, but at a somewhat slower rate, and the one Oriskany sand test was dry.

Elsewhere in the state, and in the known developed areas, drilling has continued at a lower rate than in 1945. However, the large part of this drilling was on inside or marginal leases and, though several small new shallow sand pools were discovered, there was nothing new in the Oriskany sand, aside from outpost drilling.

Outstanding unsuccessful new-field wildcats are the Oriskany test in Braxton County which was completed at the total depth of 6,340 feet in the Helderberg limestone and a test in northwestern Greenbrier County which was dry at the total depth of 4,205 feet in the Devonian.

A summary of 1946 drilling follows.

	1946		*1946*
Total permits issued	885	Combination wells completed	23
New wells completed	657	Dry holes completed	149
Oil wells drilled deeper	72	Gas wells abandoned	544
Gas wells completed	451	Oil wells abandoned	161
Oil wells completed	40	Combination wells abandoned	31
		Total wells abandoned	885

Open-flow volumes of 124 gas wells were not reported. The remaining 327 had a combined open-flow volume of 402,434,000 cubic feet, or an average per well of 1,230,000 cubic feet. This high figure is due to the Oriskany sand completions, the shallow sand average running much lower.

As compared with the corresponding figures for 1945, total completions were about the same. There were 76 less gas wells, and 11 less oil wells completed. Gas-well abandonments increased by 87 and oil-well abandonments increased by 54. Total abandonments of oil and gas wells increased 141 in 1946 over 1945 but this situation had been expected.

During the year, the Sandyville extension of the Jackson County Oriskany sand gas field spread southward several miles to a point just north of Ripley. In the same general area a commercial well on the Hopkins tract, and in the Oriskany sand, indicated a possible new pool but later drilling has apparently proved otherwise.

In the Blue Creek Oriskany sand gas pool, drilling continues with numerous

dry holes and declining rock pressures and open-flow volumes. The erratic and irregular occurrence of this area of porosity has made, and continues to make, each location something of a wildcat.

While no new gas pools of importance were found during the year in the shallower sands, in a few places, outpost wells at considerable distance from production were successfully completed.

In the northern part of Kanawha County, a few "Big lime" oil wells were completed and in western Logan County one "Big lime" oil well of considerable size was completed at year's end. Aside from these occurrences, there were no oil discoveries and the drilling of new oil wells declined to a definite low. These facts were reflected in the crude-oil production figure for the year, it having reached a low of less than 3 million barrels.

KENTUCKY[4]

The drilling of exploratory and pool wells in Kentucky has followed the general pattern of former years except that more attention has been focused on deeper drilling to the Lower Ordovician and Cambrian beds.

Approximately 950 wells were drilled for oil and gas and 10,924,283 barrels of oil were produced. This is the third year in succession for all former production records to be exceeded. Oil was produced from beds ranging in age from Pennsylvanian to Middle Ordovician, the greater percentage being from the Chester.

EASTERN KENTUCKY

As a result of the development of considerable gas in the Big Six in eastern Kentucky, more wells are being drilled to the basal beds of the Corniferous. The Sturgeon Creek oil field of Jackson County, in the early stages of development, is producing oil below a water zone in the upper part of that formation. During the early development period in the eastern part of the state, most exploratory wells were abandoned in that water zone and no doubt other productive areas will be discovered by redrilling this area.

DEEP DRILLING

The California Company's A. R. Spears No. 1, Carter coordinate SE., NE. Sec. 13-L-57, 1.7 miles northwest of McKinney, Lincoln County, is the deepest well in Kentucky. The elevation at the rotary bushing is 1,138 feet and the ground level is 1,125 feet above sea-level.

FORMATIONAL TOPS AND GENERALIZED LITHOLOGY[5]

Depth (Feet)	*Thickness (Feet)*	*Formation*
0– 418	418	Upper Ordovician (Cincinnatian). Limestone, shaly limestone, and calcareous shale
– 609	191	Middle Ordovician (Lexington). Limestone
–1,290	681	Middle Ordovician (High Bridge). Limestone, dense to fine crystalline
–1,309	19	Middle Ordovician (Everton?). Limestone, magnesian limestone, and dolomite
–4,310	3001	Lower Ordovician and Upper Cambrian. Dolomite
–4,390	80	Limestone, oolitic, somewhat magnesian
–5,110	720	Shale, gray, red, and green, and siltstone
–5,720	610	Sandstone, quartzitic
–5,761	41	Dolomite and limestone with streaks of conglomerate, arkosic sandstone, and pebbles of rhyolite
–6,117	356	Rhyolite porphyry. Total depth

[5] Copies of the electrical log may be obtained from the Lynn Blue Print Company, 121 E. Short Street, Lexington, Kentucky.

OUTLINE MAP
OF
KENTUCKY
10 0 10 20 30 Miles
NEW FIELD DISCOVERIES
1946
1 OWENSBORO 25-P-29
2 GRIFFITH 9-P-28
3 STANLEY 13-P-28
4 WILSON 6-P-23
5 TUNNEL HILL 4-N-23
6 ROBARDS N. 20-O-23
7 GUFFIE 20-N-27
8 CLEOPATRA 7-N-27
9 SEVENTY SIX D-53
10 PARRAGAN D-52
11 DESDA 7-C-52
CARROLL
TRIMBLE
HENRY
OLDHAM
SHELBY
JEFFERSON
SPENCER
MEADE
BULLITT
ANDERSON
NELSON
WASHINGTON
HANCOCK
BRECKINRIDGE
HARDIN
MARION
LARUE
HENDERSON
UNION
DAVIESS
WEBSTER
McLEAN
OHIO
GRAYSON
TAYLOR
CRITTENDEN
LIVINGSTON
HOPKINS
BUTLER
EDMONSON
HART
GREEN
CALDWELL
MUHLENBERG
ADAIR
WARREN
BARREN
METCALF
RUSSELL
LYON
MARSHALL
CHRISTIAN
TODD
LOGAN
SIMPSON
ALLEN
MONROE
CUMBERLAND
CLINTON
CALLOWAY

FIG. 4

There were numerous slight shallow showings of oil ranging from 334 to 604 feet and from 5,703 to 5,712 feet. The drill-stem test was run at 5,733 feet with negative results.

Smith-Cecil *et al.* completed a test into the upper Knox, 7 miles east of Morehead in Rowan County. Approximately 100 barrels of oil were produced and a sufficient volume of gas to drill an offset well which has been abandoned. This area merits further exploration. In 1947, there will probably be extensive exploration of the Knox and perhaps underlying beds. At present, the Pure Oil Company is drilling G. Hammonds No. 1 in 2-H-67, western Clay County, on a pronounced surface structure.

WESTERN KENTUCKY

IMPORTANCE OF NEW DISCOVERIES

Development of the new discoveries in western Kentucky in 1946 has not, by any means, defined the limits of production. The Tunnel Hill pool, Henderson County, about ½ mile north of Poole is no doubt the most important. The discovery well was completed in late October, producing 288 barrels oil per day from the Cypress sand. At the end of the year, 1 producer and 1 dry hole had been drilled; 5 other wells were being drilled or completed. It appears that this pool may be favorably comparable in size with the Dixie pool 1½ miles northwest which also produces from the Cypress.

The Wilson pool, Henderson County, 1 mile east of Geneva, while promising during the earlier days of development, has been a big disappointment. Two McClosky wells are producing from two different porous zones in the Ste. Genevieve limestone, and 4 Waltersburg wells are located on a very narrow bar. Prospects for further development are poor.

The other discoveries may or may not develop into fields of importance. Development is slow.

SOUTH-CENTRAL KENTUCKY

Discoveries in Clinton County are responsible for the maintaining of a steady production in excess of 1,000 barrels per day in that area. Much of the development is in the hands of established producers and the promotion stage has subsided.

NEW POOLS DISCOVERIES—EXPLORATORY—IN KENTUCKY

Operator	*Fee*	*Location*	*Formation*	*Total Depth (Feet)*	*Field*
BUTLER COUNTY					
F. Vernier	Barbee 1	17-I-32	Pennsylvanian	401	Rochester Cons.
HENDERSON COUNTY					
Basin Drilling Co.	Abbott 1	10-P-22	Waltersburg	1,714	Wilson

Kentucky New Pool Discoveries—Development

HENDERSON COUNTY					
Calstar	Blake 1	22-P-20	Cypress	2,650	Robinsonville
Miller & Shiarella	Leachman 3 or 4	12-N-27	Tar Springs	1,910	Panther
Basin Drilling Co.	Smith 3	9-P-23	Waltersburg	1,634	Henderson
DAVIESS COUNTY					
Fox & Fox	J. R. Grant 3	14-P-28	Jackson	1,515	Stanley

Important Wildcats in Kentucky

Operator	*Fee*	*Location*	*Reason for Drilling*	*Formation*	*Total Depth (Feet)*	*Oil-Gas*	*Field*
CLINTON COUNTY							
Fox and Fox	Burchett 1	C-52	Subsurface	Knox	2,180	Showing of oil 400 feet	Highway
GRAYSON COUNTY							
Ashland Oil & Refining	Willis 1	21-K-37	Surface	Upper Ordovician	2,601	Dry	
HENDERSON COUNTY							
E. L. Newton et al.	Dempewolf 1	13-P-27	Subsurface	Devonian	4,200	Dry	Birk City
LINCOLN COUNTY							
The California Co.	A. R. Spears 1	13-L-57	Surface	Cambrian	6,117	Dry	
ROWAN COUNTY							
Smith-Cecil et al.	Lewis 1	17-U-75	Doodle bug	Knox dolomite		Oil and gas showing	
POWELL COUNTY							
Archie Carpenter et al.	Maloney 1	25-Q-70	Acreage	Knox		Showing of gas	

Field Extensions in Kentucky

Operator	*Fee*	*Location*	*Formation*	*Total Depth (Feet)*	*Field*
JACKSON COUNTY					
Patterson, Dyer & Roeder	Wm. Vickers 1	2-K-68	Corniferous	1,017	Sturgeon Creek
MORGAN COUNTY					
Little Rock Oil Co.	Nickell 1	P-75	Corniferous	1,885	Cannel City

New Field Discoveries in Kentucky

Operator	*Fee*	*Location*	*Formation*	*Total Depth (Feet)*	*Oil-Gas*	*Field*	*Initial Production*
CLINTON COUNTY							
Bourbon Oil Co.	Cash 1	7-C-52	Upper Ordovician	1,225	Oil	Desda	15 bbls.
Buckshot Oil Co.	Sam Parragan	D-52	Middle Ordovician	1,476	Oil	Parragan	1,000 bbls.
Diamond et al.	McKinley 1	D-53	Middle Ordovician		Oil	Seventy-Six	20 bbls.
DAVIESS COUNTY							
Watkins Drilling Co.	Massey 1	25-P-29	Waltersburg	1,167	Gas	Owensboro	5,259 M R.P. 565 pounds
J. C. Ellis et al.	Shipp Heirs 2	9-P-28	Palestine	1,021	Oil	Griffith	24 bbls.
Fox & Fox	Grant 1	13-P-28	Tar Springs	1,935	Oil	Stanley	80 bbls.
HENDERSON COUNTY							
Basin Drilling Co.	Washburn 1	6-P-23	Ste. Genevieve	2,703	Oil	Wilson	200 bbls. 50 water
Carter Oil Co.	Adams 1	4-N-23	Cypress	2,253	Oil	Tunnel Jill	288 bbls.
Carter Oil Co.	Powell 1	20-O-23	Ste. Genevieve	2,705	Oil	Robards North	286 bbls.
MCLEAN COUNTY							
Basin Drilling Co.	Wiggins 1	20-N-27	Tar Springs	2,252	Oil	Guffie	85 bbls.
Sohio Petroleum Co.	Pinkston 1	7-N-27	Jackson	1,775	Oil	Cleopatra	66 bbls.

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DEVELOPMENTS IN ILLINOIS AND INDIANA IN 1946[1]

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Urbana, Illinois, and Bloomington, Indiana

ABSTRACT

Drilling in Illinois and Indiana increased by 42 per cent in 1946 as compared with 1945 and production increased by 2½ per cent. The increase in drilling was due in part to the expiration of many 10-year leases and in part to greater availability of materials and manpower. There was little deep testing in 1946 and nearly all of the new wells produced from sandstones and limestones of the Mississippian system.

The rate of drilling in 1947 will probably decline from the high level of 1946 but will probably be higher than that of 1945. It seems likely that there will be increased test drilling of pre-Mississippian strata, especially of the Silurian in the western marginal area of the Illinois basin.

INTRODUCTION

This report covers the states of Illinois and Indiana. Most of the oil and gas drilling was confined to the southern part of Illinois and southwestern part of Indiana.

Drilling in the two states increased by 42 per cent in 1946 as compared with 1945 and production increased 2½ per cent. Wildcat completions in the two states increased from 575 in 1945 to 760 in 1946, an increase of 32 per cent. Thirty-nine new fields were discovered, all of which were within a few miles of previous production, so that no new regions were opened for production. There was little deep testing and no major discovery of deeper production.

The details of development are discussed separately for each state.

ILLINOIS

By Alfred H. Bell

Drilling for oil and gas in Illinois increased by 34 per cent when 2,362 wells were completed in 1946 as compared with 1,763 in 1945. Of the total completions 633[4] are classified as wildcat wells, an increase of 37 per cent over the 460 wildcat completions in 1945. Factors in this increase were: the expiration of many 10-year leases during 1946; greater availability of materials and manpower; and higher prices for crude oil. Of the 1,729 pool development wells completed in 1946, 298 were in the Mattoon pool, Coles County. Most of the drilling here took place in the first half of the year. Development drilling occurred in many pools of which some of the most active were: Clay City Consolidated, 128 completions; Stokes-

[1] Read by title before the Association at Los Angeles, March 24–27, 1947. Manuscript received, April 11, 1947.

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[3] Professor of geology, Indiana University, Bloomington.

[4] This figure does not include wells which tested additional producing zones in producing areas classified by Lahee as deeper-pool tests and shallower-pool tests.

Brownsville, 88 completions; Marine, 54; Herald, 51; and Calhoun Consolidated, 50.

Total oil production in Illinois in 1946 was 75,297,000 barrels, as compared with 75,094,000 barrels in 1945, an increase of about 0.3 per cent. Average daily production during 1946 was 206,000 barrels. Average daily production, by months, during the year varied between 197,000 barrels (December) and 212,000 barrels (May).

NEW POOLS DISCOVERED

Thirty-one new pools[5] were discovered in Illinois in 1946 (Table I, and Fig. 1), 58 extensions to pools were discovered by wildcat wells (Table II), and 33 wells, most of which can not be designated properly as exploratory wells, discovered additional producing zones in producing areas (Table III).

Most of the new pools discovered were located within a short distance of previous production. Those farthest away from previous production were Lillyville, Cumberland County (19, Table I, Fig. 1), Omega, Marion County (23, Table I, Fig. 1), and Waverly gas (30, Table I, Fig. 1), none of which is as much as 20 miles from previous production.

IMPORTANT EXPLORATORY WELLS

A list of some of the most noteworthy dry holes is given in Table IV. On the whole there was little deep testing in Illinois in 1946. Of the 14 wells listed in Table IV, all but two (Nos. 2 and 10) were located wholly or in part on the basis of subsurface geology. Number 2 was located by seismograph only, and numbers 1, 5, and 6 were located by a combination of subsurface geology and seismograph. Number 10, the Trempealeau test in McLean County, was located without a scientific basis.

The geographic pattern of exploratory drilling in Illinois and Indiana in 1946 followed that established in the last few years except for an increased relative amount in Coles and surrounding counties in Illinois resulting from the development of the Mattoon pool.

An analysis of the methods used in locating wildcat wells in Illinois is given in Table V.

The amount of geophysical exploration, by months, during 1946 in Illinois and Indiana is given in Table VI. The method used most is the reflection seismo-

[5] A strict distinction between the terms field and pool is difficult to maintain for the Illinois-Indiana area because of the large number of producing formations, several of which are confined to a relatively small stratigraphic section, and because of the large number of separate productive lenses in a single producing zone. The number of oil and gas pools (defined as separate reservoirs) is not accurately known but is undoubtedly more than a thousand for Illinois alone. If a field is defined as all of the pools on a single well defined structural feature, the Southeastern Illinois field located on the LaSalle anticlinal belt is a good example. But for many of the newer producing areas in the Illinois basin there is much room for difference of opinion as to a proper grouping into "fields." The word pool is used in this report to mean, in general, a separate producing area, but there are numerous exceptions where two or more separate producing areas are grouped together under a single pool name.

TABLE I

Discovery Wells of New Pools in Illinois in 1946

Pool	*County*	*Company and Farm*	*Location*	*Total Depth (Feet)*	*Producing Formation*	*Depth to Top (Feet)*	*Initial Production (Barrels)**
1. Beaver Creek South	Clinton	J. L. Garard, Viereggе-Mahlandt 1	7-3N-2W	1,146	Bethel	1,131	17; 42
2. Boos East	Jasper	Secure Oil, C. L. Ireland 1	11-6N-10E	2,673	Rosiclare; McClosky	2,657; 2,672	66; 4
3. Browns East	Wabash	Magnolia, W. J. Pfeiffer 1	11-2S-14W	3,050	Cypress	2,596	12; 34
4. Clarksburg	Shelby	Sohio, Flenner 1	17-10N-4E	1,788	Bethel	1,774	12; 16
5. Concord North	White	C. E. Brehm, Callicotte 1	10-6S-10E	2,960	Aux Vases	2,950	248
6. Cooks Mills North	Coles	Nolan, Coombs Est. 1	23-14N-7W	1,795	Rosiclare	1,771	12
7. Covington East	Wayne	K. & B. Drlg., Smith 1	21-1S-7E	3,323	Aux Vases	3,144	73
8. Crossville	White	Inland Prod., Rister 1	15-4S-10E	3,164	McClosky	3,123	18; 10
9. Epworth East	White	Allen, Hanna 1	28-5S-10E	2,743	Cypress	2,706	50
10. Flora South	Clay	Deep Rock, Given 1	4-2N-6E	2,988	McClosky	2,978	189
11. Friendsville Central	Wabash	G. Engle, D. Wilkinson 1	14-1N-13W	2,344	Bethel	2,321	40; 5
12. Friendsville North	Wabash	Heldt, Smith 1	12-1N-13W	2,539	Biehl	1,644	8
13. Hidalgo North	Cumberland	Central Pipe Line, S. Meyers 1	36-9N-9E	2,776	Rosiclare	2,648	15
14. Hoosier	Clay	N. V. Duncan, J. Leonard 1-A	2-4N-7E	3,007	Cypress	2,550	145; 7
15. Hoosier North	Clay	Eason Oil, N.E. Gibson 1	35-5N-7E	2,823	Aux Vases	2,803	30
16. Junction North	Gallatin	J. Reznik, A. Valter 1	3-9S-9E	2,749	Aux Vases	2,726	8; 24
17. Lancaster Central	Wabash	S. Malis, W. Fite 1	7-1N-13W	2,824	Rosiclare	2,813	900
18. Lancaster South	Wabash	S. Malis, Litherland 1	20-1N-13W	2,809	McClosky	2,720	160; 10
19. Lillyville	Cumberland	Nat'l. Assoc. Pet. Krogmann 1	31-9N-7E	2,454	McClosky	2,450	140
20. Massilon	Wayne	Texas, E. Hines "C" 1	1-1S-9E	3,262	Lower O'Hara	3,254	192
21. Maud North	Wabash	Hayes & Wolfe, Smith 1	17-1S-13W	2,806	Bethel	2,606	26; 26
22. Omaha East	Gallatin	Deep Rock, Pioneer Trust Bk. 1	2-8S-8E	2,980	Lower O'Hara	2,853	19
23. Omega	Marion	Doran & Delta, Millican Est. 1	16-3N-4E	2,499	McClosky	2,488	59
24. Richview	Washington	Nat'l Consumers Oil Koelling-Pitchford 1	10-2S-1W	1,532	Cypress	1,520	31
25. Ridgway	Gallatin	Wiser Oil, Mitsdarffer 1	24-8S-8E	2,938	McClosky	2,842	21
26. Sandoval West	Clinton	Doran, Thomas 1	13-2N-1W	1,423	Cypress	1,417	22; 96
27. Shelbyville	Shelby	Britton, Kensil Heirs 1	21-11N-4E	1,855	Aux Vases	1,830	2; 3
28. Stanford South	Clay	T. B. Dirickson, Howell 1	9-2N-7E	3,205	Aux Vases	2,959	175
29. Wakefield	Jasper	J. W. Rudy, Dewhirst 1	16-5N-9E	3,184	Rosiclare	3,122	40; 52
30. Waverly	Morgan	Ladet, Stenemeyer 1	22-13N-8W	265	Pennsylvanian	256	1,700,000 cu. ft.
31. Willow Hill East	Jasper	Pure & Carter, Dodd 1	6-6N-11E	2,732	McClosky	2,642	100

* Oil and water.

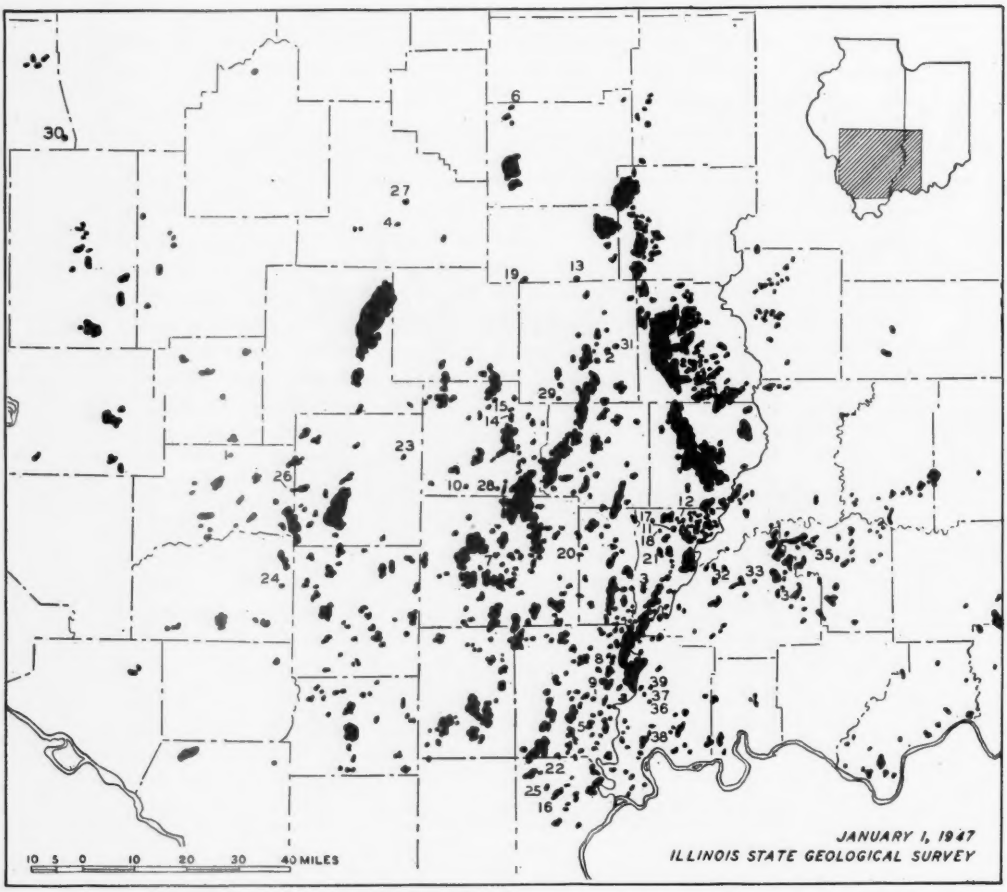

FIG. 1.—New pools discovered in 1946. All present and former oil and gas producing areas are shown in black. (See Tables I and VII for pool identification.)

TABLE II

TABLE II

Discovery Wells of Extensions to Pools in Illinois in 1946

Pool	County	Company and Farm	Location	Total Depth (Feet)	Producing Formation	Depth to Top (Feet)	Initial Production (Barrels)*
1. Aden South	Hamilton	Weinert, Hall 1	29-3S-7E	3,446	Aux Vases; Rosiclare	3,249; 3,335	26; 80
2. Bartelso West	Clinton	Goldschmidt, Loepker 1	19-1N-3W	963	Cypress	938	10; 15
3. Boos North	Jasper	Lynn, Houser-Sears 1	21-6N-10E	2,812	McClosky	2,800	117
4. Browns	Wabash	Gilliam & Aspin, H. L. Herin 1	27-1S-14W	2,971	Lower O'Hara	2,965	240
5. Browns East	Wabash	Magnolia, J. Hirschelman Unit 1	14-2S-14W	2,582	Cypress	2,575	300
6. Brownsville	White	McBride, Pryor 1	32-5S-9E	3,180	Lower O'Hara	3,099	5; 20
7. Brownsville	White	Pure, Adams "A"	6-6S-9E	3,170	Rosiclare	3,097	100; 118
8. Bungay Consol.	Hamilton	Magnolia, Rohrer 1	23-4S-7E	3,290	Aux Vases	3,273	27; 3
9. Calhoun Consol.	Richland	Pure, Howard 1	13-2N-9E	3,170	McClosky	3,147	1,305
10. Cisne	Wayne	Lynn, Dye 1	2-1S-7E	3,166	McClosky	3,148	256
11. Clay City Consol.	Clay	Robinson & Puckett, S. Bates 1	14-2N-8E	3,035	Rosiclare	3,018	1,322
12. Clay City Consol.	Wayne	Redwine, C. E. Downer 1	31-1N-8E	3,216	Lower O'Hara	3,122	115
13. Clay City Consol.	Wayne	Slagter, Crisman 1	32-1N-8E	3,153	Aux Vases	3,054	277
14. Clay City Consol.	Wayne	Slagter, Trotter 1	20-1N-8E	3,100	McClosky	3,096	66; 7
15. Clay City Consol.	Wayne	Slagter, R. Pierce 1	22-2N-8E	3,052	McClosky	3,029	432
16. Clay City Consol.	Wayne	Ill. Mid-Cont., H. Miller 1	13-1N-7E	3,148	Rosiclare	3,108	30; 70
17. Clay City Consol.	Wayne	Slagter, Gray 1	16-1S-8E	3,281	Aux Vases	3,104	38
18. Clay City Consol.	Wayne	Redwine, M. A. Brown 1	31-2N-9E	3,109	McClosky	3,059	6
19. Clay City Consol.	Wayne	McCall and Cline, Atterberry 1	14-1N-7E	3,140	Aux Vases	3,016	8; 24
20. Covington East	Wayne	Nation, Gallagher 1	16-1S-7E	3,236	McClosky	3,219	10; 50
21. Epworth East	White	Allen, Williams 1	33-5S-10E	3,126	Aux Vases	3,002	24; 36
22. Friendsville North	Wabash	Leavitt, A. L. Gher 1	1-1N-13W	1,621	Biehl	1,607	83
23. Gallagher	Richland	Pure, Gallagher 1	12-2N-9E	3,181	McClosky	3,166	786
24. Goldengate Consol.	Wayne	Fulk, L. B. Ellis 1	29-2S-9E	3,477	Rosiclare	3,408	30; 25
25. Herald	White	Oil Management, Williams 1	14-7S-9E	2,882	Aux Vases	2,803	108; 2
26. Hoosier	Clay	Robinson & Puckett, Roley 1	11-4N-7E	2,934	Rosiclare	2,916	205
27. Hoosier	Clay	K-B Drlg., Hastings 1	12-4N-7E	2,638	Cypress	2,603	25
28. Ingraham West	Clay	Brinkerhoff, O. A., Barlow 2	11-5N-7E	2,539	Cypress	1,525	165
29. Ingraham West	Clay	Gilliam & Aspin, H. D. Lewis 1	15-5N-7E	2,941	McClosky	2,870	15; 35
30. Iron	White	Nat'l Assoc. Pet., Fisher 1	13-6S-8E	2,339	Tar Springs	2,328	84; 20
31. Johnsonville West	Wayne	Deep Rock, Ulysses 1	30-1N-6E	3,178	McClosky	3,151	71
32. Johnsonville West	Wayne	Deep Rock, Spicer 1	25-1N-5E	3,086	McClosky	3,072	12
33. Keenville	Wayne	Markham, Keeler-Ellis 1	21-1S-5E	3,126	McClosky	3,118	29; 9
34. Keenville	Wayne	Mitchell, Cornstubble 1	27-1S-5E	2,973	Aux Vases	2,960	175; 300
35. Lawrence	Lawrence	Zanetis, American Nat'l Bank 1	23-3N-11W	1,942	McClosky	1,849	18; 3
36. Marine	Madison	Loper, M. Reding 1	14-4N-6W	1,793	Silurian	1,759	80; 170
37. Markham City West	Jefferson	Gulf, Green 1	10-3S-4E	3,056	McClosky	3,031	128; 15
38. Markham City West	Jefferson	Brehm, Modglin 1	34-2S-4E	3,092	McClosky	3,061	12; 50
39. Mason South	Clay	Lynch, Wright 1	3-5N-5E	2,521	McClosky, Rosiclare	2,439; 2,425	28; 1
40. Mattoon	Coles	Nat'l Consumers, Arthur 1	2-12N-7E	1,962	Rosiclare	1,934	22; 27
41. Maud North	Wabash	Hayes & Wolfe, Meyer 1	8-1S-13W	2,578	Bethel	2,550	140
42. Maunie North	White	Thompson, E. Bruggen 1	13-5S-10E	3,207	McClosky	3,192	20
43. Mt. Auburn	Christian	Wrather, Thomspon 1	15-15N-2W	1,896	Silurian	1,870	31; 42
44. New Harmony-Griffin Consol.	White	Superior, H. C. Ford 27	8-5S-14W	3,007	McClosky	2,935	400
45. Newton	Jasper	Menhall, J. Eaton 1	13-6N-9E	2,943	Rosiclare	2,939	168
46. Panama	Bond	Bond Co. Gas, Harwood 2	36-7N-4W	753	Pennsylvanian	735	2,000,000 cu. ft.
47. Parkersburg Consol.	Richland	Slagter, Fisher 1	4-2N-14W	3,150	McClosky	3,125	6; 60
48. Roland	White	Sun Oil, Okerson 1	9-7S-8E	3,114	McClosky	3,018	12; 36
49. St. Francisville East	Lawrence	Bauer, Brevoort 1	10-2N-11W	1,852	Bethel	1,701	10
50. Sailor Springs Consol.	Clay	K-B Drlg., Patton 1	21-3N-7E	3,080	Bethel	2,784	8; 25
51. Samsville North	Edwards	Central Pipe Line, Tarpley 2	31-1N-14W	2,940	Bethel	2,934	70; 8
52. Springerton	Hamilton	Sohio, Thomas 1	11-4S-7E	3,504	Aux Vases	3,270	8; 1
53. Stanford South	Clay	Rudy, O. Tackett 1	8-2N-7E	3,087	McClosky	3,080	11; 12
54. Stokes	White	Pure & Carter, E. S. Munsey 1	8-6S-9E	3,205	Hardinsburg	2,555	169
55. Storms	White	Sinclair and Ohio, Holderby 4	12-6S-9E	3,141	Tar Springs, Waltersburg	2,320; 2,251	9; 20
56. Trumbull	White	Lewis, Nibling 1	7-5S-9E	3,270	Rosiclare	3,260	146; 10
57. Trumbull	White	Lewis, Bingham 1	17-5S-9E	3,173	Aux Vases	3,162	65; 144
58. Willow Hill	Jasper	Lynn, Hippler 1	27-7N-10E	2,776	McClosky	2,668	60

* Oil and water.

TABLE III

DISCOVERY WELLS OF ADDITIONAL PRODUCING ZONES IN POOLS IN ILLINOIS IN 1946

Pool	*County*	*Company and Farm*	*Location*	*Total Depth (Feet)*	*Producing Formation*	*Depth to Top (Feet)*	*Initial Production (Barrels)*[a]
1. Aden South	Hamilton	Weinert, Hall 1	29-3S-7E	3,446	Aux Vases	3,249	26; 80[b]
2. Aden South	Hamilton	Weinert, Hall 1	29-3S-7E	3,446	Rosiclare	3,335	26; 80[b]
3. Benton	Franklin	Shell, Doty 1	25-6S-2E	2,162	Degonia	1,737	72; 146[b]
4. Browns	Wabash	Gilliam & Aspin, H. L. Hering 1	27-1S-14W	2,971	Lower O'Hara	2,965	240
5. Covington East	Wayne	Tex Harvey, Marshall Smith 1	21-1S-7E	3,260	Lower O'Hara	3,208	60;10[b]
6. Cowling	Edwards	G. H. Wickham, Schroeder 5	27-2S-14W	2,239	Tar Springs	2,229	50
7. Epworth East	White	W. O. Allen, J. Williams 1	33-5S-10E	3,126	Aux Vases	3,002	24; 36
8. Geff	Wayne	Robinson & Puckett, Haymes 1	1-1S-7E	3,188	Lower O'Hara	3,140	5[b]
9. Herald	White	Oil Management, J. J. Harrell 1	14-7S-9E	2,972	Lower O'Hara	2,962	243
10. Herald	White	Pure Oil, Austin Consol. "B" 1	34-6S-9E	3,160	Rosiclare	3,005	37; 61
11. Hoosier	Clay	K-B Drlg., Stanley 1	11-4N-7E	3,003	Aux Vases	2,842	55; 125
12. Hoosier	Clay	N. V. Duncan, Gibson 1	2-4N-7E	2,984	Rosiclare	2,894	264
13. Ingraham West	Clay	Cities Service, Wyatt 5	13-5N-7E	2,946	Aux Vases	2,762	150
14. Ingraham West	Clay	Kingwood, Wyatt 1	14-5N-7E	2,938	Bethel	2,680	102; 94[c]
15. Ingraham West	Clay	Cities Service, Wyatt 1	13-5N-7E	2,950	Rosiclare	2,842	764
16. Keenville	Wayne	Wiser, Keen 1	28-1S-5E	3,129	Lower O'Hara	3,060	150; 75
17. Markham City West	Jefferson	Brehm, Modglin 1	34-2S-4E	3,092	McClosky	3,061	12; 50
18. Mt. Carmel	Wabash	First Nat'l. Pet. Trust, Shaw-Courter 2-A	7-1S-12W	1,390	Bridgeport	1,368	13
19. Newton	Jasper	Menhall, James Eaton 1	13-6N-9E	2,943	Rosiclare	2,939	168
20. Noble North	Richland	Pure Oil, L. A. Wasson 3	27-4N-9E	2,990	Rosiclare	2,958	60; 19
21. Olney East	Richland	Texas, F. Scherer 2	23-4N-10E	3,062	Lower O'Hara	3,048	16[b]
22. Olney East	Richland	Texas, R. Scherer 2	23-4N-10E	3,062	Rosiclare	3,053	16[b]
23. Stanford South	Clay	Texas, E. Kitley 2	16-2N-7E	3,109	McClosky	3,097	33
24. Stokes	White	Pure & Carter, E. S. Munsey 1	8-6S-9E	3,205	Hardinsburg	2,555	169
25. Stokes-Brownsville	White	Winfrey Drlg., Spence 2	17-6S-9E	2,108	Palestine	2,084	16; 40
26. Storms	White	Sinclair & Ohio, Riechen 2	1-6S-9E	3,030	Aux Vases	3,014	220; 10[b]
27. Storms	White	Sinclair & Ohio, Aldrich 1	1-6S-9E	2,366	Tar Springs	2,354	42
28. Thackeray	Hamilton	Ryford Oil, V. Johnson 3	10-5S-7E	3,598	Lower O'Hara	3,459	19; 16
29. Thackeray	Hamilton	Ryford Oil, V. Johnson "A" 1	10-5S-7E	3,550	McClosky	3,535	128; 10
30. Trumbull	White	Pure Oil, W. T. Hall 1	19-5S-9E	3,158	Aux Vases	3,150	57; 13
31. Trumbull	White	W. I. Lewis, Nibling 1	7-5S-9E	3,270	Rosiclare	3,260	146; 10
32. Waverly	Morgan	L. M. Ladet, McMahan 1	22-13N-8W	1,543	Devonian	980	1,270,000 cu. ft.
33. Willow Hill	Jasper	Secure Oil, L. Mascher 1	3-6N-10E	2,673	Rosiclare	2,661	255

[a] Oil and water.
[b] Dual completion.
[c] Triple completion.

graph and the number of crews increased from 4 in January to 8 in December. In Indiana only the magnetometer method was reported in use.

STRATIGRAPHY

The geologic system which produces most of the oil in Illinois and Indiana continues to be the Mississippian, and the bulk of the discoveries of new fields, extensions, and new producing formations were in the Mississippian.

TREND IN EXPLORATION, LEASING AND DRILLING

The trend in leasing and drilling was downward in the latter part of 1946 but this was partly seasonal. There will probably be less drilling, both wildcat and

TABLE IV

SELECTED LIST OF DRY TESTS IN ILLINOIS IN 1946

Pool	*County*	*Company and Farm*	*Location*	*Total Depth (Feet)*	*Deepest Formation*	*Depth to Top (Feet)*
1.	Bond	Sohio, Mohme 1	14-6N-5W	2,668	Trenton	2,608
2.	Bond	Sohio, Long 1	26-6N-5W	2,768	Trenton	2,623
3. Mattoon	Coles	S. H. & K. Drlg., Strong 1	22-12N-7E	3,191	Devonian	3,111
4.	Coles	Obering, Biemer 1	26-14N-7E	2,888	Devonian	2,873
5.	Crawford	Nat'l. Assoc. Pet., Stifle 1	6-6N-11W	3,281	Devonian	2,878
6.	Cumberland	Nat'l. Assoc. Pet., Handley 1	26-10N-7E	3,815	Devonian	3,670
7. Lillyville[a]	Cumberland	Nat'l Assoc. Pet., Krogman 3	31-9N-7E	4,000	Devonian	
8. Rural Hill	Hamilton	Shell, Nohava 4	13-6S-5E	5,481	Devonian	5,104
9. Boyd	Jefferson	Superior, Friedrich 19	19-1S-2E	3,870	Devonian	3,737
10.	McLean	Minnesota Prod., McGowan 1	33-24N-5E	3,510	Trempealeau	3,260
11.	Madison	Jarvis & Marcell, Hitz 1	8-5N-5W	2,797	Trenton	2,692
12. Tonti[b]	Marion	Harvey, Kagy 1	33-3N-2E	4,900	Trenton	4,769
13. Waverley[c]	Morgan	Ladet, McMahan 11	22-13N-8W	1,543	Trenton	1,400
14.	St. Clair	Young, McCurdy 6	29-3S-6W	2,368	Maquoketa	2,312

[a] Plugged back to McClosky oil.
[b] Plugged back to Devonian oil.
[c] Plugged back to Devonian gas.

pool development, in 1947 than in 1946. The expiration of additional 10-year leases, the higher prices for crude oil, and continued high demand, all favor continued activity in leasing and drilling, and it seems likely that total drilling will exceed that of 1945.

There is much interest in prospecting for Silurian reef production in the western marginal area of the Illinois basin. A considerable amount of leasing has been done and there will probably be exploratory drilling in this area in 1947. Plans have been announced for testing the pre-St. Peter Ordovician and Cambrian strata on the Pittsfield-Hadley anticline in western Illinois. If production should be found it would stimulate further testing of these strata.

INDIANA

By RALPH E. ESAREY

During the year 1946, drilling activity in the petroleum industry exceeded all expectations with an increase of 75 per cent in well completions and an increase of more than 200 per cent in the total initial production from new wells. A total of 508 wells were drilled during the year, of which 431 were pool wells and 127

TABLE V

WILDCAT WELLS DRILLED IN ILLINOIS IN 1946, CLASSIFIED BY METHOD OF LOCATION

Method of Location	Wildcat Near[a]		Wildcat Far[b]		Total Wildcats	Total Producers	Percentage Successful
	Total	Producers	Total	Producers			
Geology	206	55	252	27	548	82	15.0
Seismograph	4	1	1	1	5	2	40.0
Geology and seismograph	11	2	28	3	39	5	12.8
	311	58	281	31	592	89	15.0
Nonscientific	2	0	35	0	37	0	0.0
Unknown	1	0	3	0	4	0	0.0
Total	314	58	319	31	633	89	14.0

[a] One half to 2 miles from production.
[b] More than 2 miles from production.

TABLE VI

GEOPHYSICAL EXPLORATION, BY MONTHS, IN ILLINOIS AND INDIANA IN 1946

Period (1946)	Illinois				Indiana			
	Seis.	Grav.	Magnet.	Res.	Seis.	Grav.	Magnet.	Res.
	(a) (b)							
Jan.	4–16							
Feb.	5–18							
Mar.	5–21							
Apr.	5–17							
May	5–20							
June	5–25		1–3				2–6	
July	6–23		1–1	1–3			2–8	
Aug.	6–24			1–4			2–8	
Sept.	6–30			1–5			2–10	
Oct.	6–24			1–4			2–8	
Nov.	7–25	1–2		1–4				
Dec.	8–30	1–5		1–5				

[a] First figure indicates number of crews working.
[b] Second figure indicates number of working weeks completed.

TABLE VII

DISCOVERY WELLS OF NEW POOLS IN SOUTHWESTERN INDIANA IN 1946

Pool	County	Company and Farm	Location	Total Depth (Feet)	Producing Formation
32. Grand Rapid	Gibson	Ill. Midcontinent, Parkinson 2	24-1S-12W	2,095	Bethel
33. Princeton N.E.	Gibson	Eldin Hayden, Crecilius 2	5-2S-10W	2,080	McClosky
34. Francisco W.	Gibson	L. A. Plumb, Coleman Comm. 1	7-2S-9W	1,965	Ste. Genevieve
35. Union Bowman New	Pike	W. L. Litchlyter, A. Conley 1	3-1S-9W	1,058	Waltersburg
36. Springfield	Posey	H. E. Ledbetter, N. Utley 1	30-5S-13W	3,111	Ste. Genevieve
37. Springfield N.	Posey	Calvert et al., Fretageat 1	24-5S-14W	2,029	Palestine
38. Farmersville S.	Posey	Paul Rossi, Rippey 1	30-6S-13W	2,484	Pennsylvanian
39. New Harmony E.	Posey	Calvert & Willis, Fred Wiley 1	18-5S-13W	2,023	McClosky

TABLE VIII

DISCOVERY WELLS OF EXTENSION TO POOLS IN SOUTHWESTERN INDIANA IN 1946

Pool	County	Company and Farm	Location	Total Depth (Feet)	Producing Formation
Dodds Bridge	Sullivan	Roy Myers and Ohio Oil Co., E. Hayden 1	10-8N-10W	1,483	Salem
Mt. Carmel	Knox	H. E. Ledbetter, Steckler 1	22-1S-12W	2,088	Bethel
Dodds Bridge	Sullivan	Roy Myers and Ohio Oil Co., O. Benson	10-8N-10W	1,458	Salem
Rich Valley	Wabash	J. Minneci, Ida Votaw 1	12-27N-5E	870	Trenton
Troy	Spencer	Stroble-Busick 1	11-6S-4W	723	Cypress

were wildcat wells. Seventeen discovery wells were drilled, 15 of them finding new oil fields or extensions, and 2 opening new gas fields or extensions. About 83 per cent of the pool wells were producers and 13 per cent of the wildcat wells encountered commerical production. Only a 10 per cent increase in wildcatting took place, but the stage in the development of the basin and the general industrial situation account for this figure. The total footage of new holes amounted to 985,743 feet, which increased the daily production of oil by 7,743 barrels.

The greatest activity took place in the pools along the Wabash River in Posey and Gibson counties. Seven of the new fields and most of the additional production were found in this area. However, many pool wells were drilled in central and western Gibson County, where the Princeton North field has been extended into the city limits of Princeton. Another town-lot "boom" may be in prospect. Two active areas in southern Knox County are creating unusual interest also, and more development is expected during the coming year.

Roy Myers and the Ohio Oil Company opened a new pool in Sullivan County where 6 wells have been completed in the Salem limestone at an average depth of 1,400 feet. This is an extension of the Dodds Bridge field. Production is reported as about 150 barrels daily per well. An extension of the Troy field in Spencer and Perry counties was made by C. A. Busick, who completed two wells in the lower Chester, reported as producing 75 barrels each.

Outside of the Eastern Interior basin, the Horton field in Hamilton County is the most active. As previously reported, it is an extension of the old Trenton pool, producing at 1,050–1,100 feet. The new wells vary in initial production from 25 to 75 barrels per day. New completions were reported in the Henderson field in Jay County, near the state line of Ohio. The wells were small, however, and did not add greatly to the production of the field. Some additional testing was done near the old Rich Valley field of Miami County, but the results were discouraging. Two small producers were completed which might be considered extensions, but it is doubtful if they prove commercial.

Some of the interesting deep tests were as follows: Continental Oil Company's Cooper Estate in Sec. 13, T. 3 S., R. 14 W., Griffin field, tested the Trenton; Duncan *et al.* Miller No. 1 in Sec. 18, T. 9 N., R. 5 W., Owen County, reached the Glenwood-St. Peter formation; J. Regan's Luther No. 1, Sec. 19, T. 10 N., R. 6 W., Clay County, tested the Glenwood-St. Peter horizon also; and the Kankakee Development Company's State Bank of Renssalaer No. 1 in Sec. 14, T. 30 N., R. 6 W., Jasper County, was abandoned in the Mt. Simon sandstone of Cambrian age.

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DEVELOPMENTS IN MICHIGAN IN 1946[1]

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ABSTRACT

Results of exploratory drilling in Michigan in 1946 were disappointing for the second consecutive year. Of the 259 wildcat wells drilled during the year, 26 were completed as producing wells. Twelve oil fields and 6 gas fields were discovered, 5 oil fields and 2 gas fields were extended, and a new pay zone was found in 1 field. Only one of the new fields, Brenner, Allegan County, was sufficiently developed to add appreciable new oil reserves. A second oil discovery, Stony Lake, Oceana County, completed late in November, gave indications of a promising field although at the year's end no tests other than the discovery had been developed.

During 1946, 822 drilling permits were issued, an increase of 67 over 1945. Well completions totaled 823 compared with the 801 of the previous year. Forty-four per cent of the wells were productive. Average initial production of oil wells was 651 barrels per well, and average initial production of gas wells was 7,371,000 cubic feet per well. Total footage drilled was 1,705,694 feet, approximately 15 per cent less than in 1945. Wildcat footage was 608,839 feet.

Oil production declined approximately 1 per cent to a 4-year low of 17,074,518 barrels. Gas production, however, showed an increase of 2 per cent for a new high of 23,774,495,000 cubic feet.

Some seismograph surveys were made in the "Thumb" and east-central Michigan, but core drilling continued to be the most common method of exploration. Permits were issued for 186 geological tests, of which 60 per cent were in western Michigan.

The Sun Oil Company started work on 2 secondary-recovery projects in Michigan in 1946. The Edenville oil field, Midland County, is to be water-flooded and the East Norwich oil field, Missaukee County, is to be repressured with gas.

INTRODUCTION

Activity in oil and gas operations continued in 1946 at about the same rate as during 1945. Drilling permits totaled 822 for the year compared with 741 in 1945. Well completions increased to 823 from the 801 of the previous year. Oil and gas wells totaled 362, a success rate of 44 per cent. Total footage drilled was 1,705,694 feet, a decrease of 299,350 feet. Wildcat drilling decreased during the year, with 259 wildcat wells completed, compared with 302 in 1945. Twelve oil fields and 6 gas fields were discovered, 5 oil fields and 2 gas fields extended, and a new pay zone was found in 1 field.

OIL

Almost two-thirds of the oil wells completed in 1946 were in the "Basin" (central Michigan). This district produced nine-tenths of the state's 1946 oil. Oil production for the year was 17,074,518 barrels, only 192,975 barrels less than in 1945. Comparative distribution of wells and production in the districts of the state is shown in Table I.

Although the number of oil fields discovered during the year compares favorably with discoveries of recent years, only minor new reserves were added. Ac-

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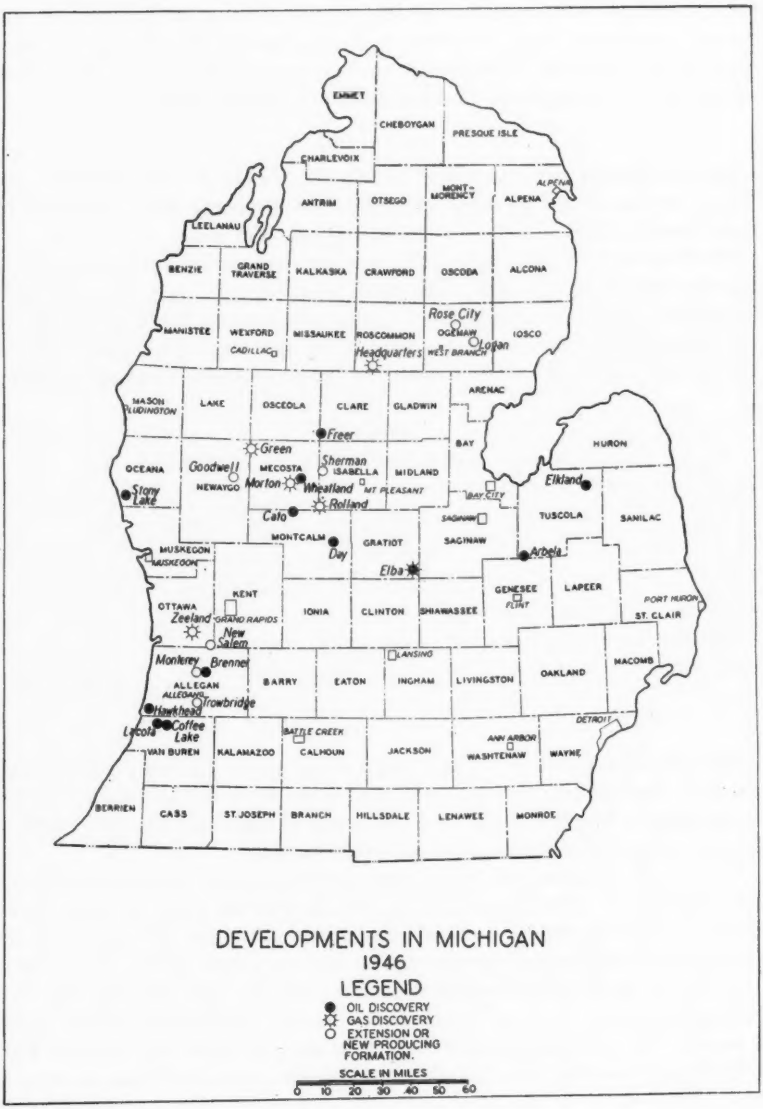
EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
CADILLAC
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
Rose City
Logan
WEST BRANCH
Headquarters
MASON
LUDINGTON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
Freer
BAY
HURON
Green
OCEANA
Goodwell
MECOSTA
Sherman
ISABELLA
MIDLAND
Elkland
Stony Lake
NEWAYGO
Morton
Wheatland
MT PLEASANT
Rolland
BAY CITY
Cato
SAGINAW
TUSCOLA
SANILAC
MONTCALM
GRATIOT
MUSKEGON
MUSKEGON
Day
Elba
Arbela
KENT
GENESEE
FLINT
LAPEER
PORT HURON
ST. CLAIR
OTTAWA
Zeeland
GRAND RAPIDS
IONIA
CLINTON
SHIAWASSEE
New Salem
LANSING
Monterey
Brennet
OAKLAND
MACOMB
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
Trowbridge
Hawkhead
Coffee Lake
Lacota
DETROIT
BATTLE CREEK
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
ANN ARBOR
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
DEVELOPMENTS IN MICHIGAN
1946
LEGEND
OIL DISCOVERY
GAS DISCOVERY
EXTENSION OR NEW PRODUCING FORMATION.
SCALE IN MILES
0 10 20 30 40 50 60

FIG. 1

cording to reserve estimates in the *Oil and Gas Journal* of January 25, 1947, Michigan developed 12,475,000 barrels of new reserves in 1946. Only 1,000,000 barrels of this, however, is credited to 1946 discoveries, the balance being due to revision of previous estimates and to extension of known fields.

DISCOVERIES

Twelve oil fields were discovered in 1946 (Table II). At the end of the year 5 of these new fields had no other wells than the discovery well, 5 fields had expanded from 3 to 6 wells, one to 11 wells, and one to 17 wells.

The Brenner field, Allegan County, was the most active of the new fields. The discovery well, W. Spencer Cook's Brenner No. 1, Sec. 15, T. 3 N., R. 13 W., drilled to 1,684 feet, in the Traverse limestone, was completed on February 5, 1946, with an initial natural production of 125 barrels per day. During the year 17 oil wells were drilled in the field and approximately 250 acres proved. Average drilled pay

TABLE I

SUMMARY OF OPERATIONS, BY DISTRICTS, IN MICHIGAN DURING 1946

District	*Permits Issued*	*Wells Completed*	*Oils Wells*	*Initial Production Oil (Barrels)*	*Gas Wells*	*Initial Production Gas (1,000 Cu. Ft.)*	*Dry Holes*	*Production in 1946*	
								Oil (Barrels)	*Gas (1,000 Cu. Ft.)*
Basin	460	477	133	134,882	126	930,439	218	15,527,616	21,712,724
SW. Michigan	281	268	81	9,338	3	1,378	184	1,346,220	58,477
West Michigan	43	36	2	670	9	86,478	31	141,519	2,003,294
All other parts of state	38	42	7	257	1	6,407	28	59,163	
Totals	822	823	223	145,147	139	1,024,702	461	17,074,518	23,774,495

thickness is 2 feet. Initial productions, averaging 180 barrels per day, ranged from 10 to 800 barrels per day. Total production from the field during 1946 was 106,952 barrels. The Brenner field, ½ mile north of the South Monterey field, was discovered as a result of subsurface and trend studies.

The Carter Oil Company discovered the Stony Lake field, Oceana County, approximately 11 miles southwest of the abandoned Hart oil field, Oceana County, a 1932 discovery, and 20 miles northwest of the Muskegon oil field, Muskegon County, a 1927 discovery. The discovery well, Miller No. 1, Sec. 11, T. 13 N., R. 18 W., was completed on December 3, 1946, at 1,631 feet in the Traverse limestone. Natural initial production was 570 barrels of 44.9° gravity oil per day. No other tests had been made at the end of the year, but the Carter Oil Company had made a south offset location for a proposed Niagaran test. The Carter discovery well was located as a result of an extensive core-drill program and opens a large area in western Michigan for exploration and development.

In the "Basin" the Freer oil field, Clare County, was discovered by the Pure Oil Company. The discovery well, Freer No. 1, Sec. 18, T. 17 N., T. 6 W., drilled

TABLE II

Discovery Wells in Michigan During 1946

County	Field	Section Township Range	Operator	Well	Permit Number	Month and Day 1946	Depth To Prod. Formation (Feet)	Initial Production		Formation	Method of Location*	Number of Wells Jan. 1, 1947
								Oil (Barrels)	Gas (1,000 Cu. Ft.)			
				NEW FIELDS								
Allegan	Brenner	15-3N-13W	W. S. Cook	Brenner 1	12,072	2-5	1,680	125		Trasverse	T	17
Allegan	Hawkhead	20-1N-16W	J. E. Hood	Taylor 1	12,390	7-9	1,103	140		Traverse	T	11
Clare	Freer	18-17N-6W	Pure Oil Co.	Freer 1	11,833	5-3	5,038	100	26,539	Detroit River	CD-S	1
Gratiot	Elba	15-9N-1W	A. E. Williams	Kral 1	11,980	1-4	2,436	70		Traverse	G	4
Gratiot	Elba	15-9N-1W	A. E. Williams	Long 1	12,106	3-7	670		12,431	"Mich. Stray"	G	2
Isabella	Rolland	30-13N-6W	West Michigan Consumers Co.	Lake 1	12,283	5-25	1,335		2,500	"Mich. Stray"	G	2
Mecosta	Green	18-16N-10W	Ashby Drilling Co.	Battle-Rekeny 1	12,253	5-5	1,239		1,600	"Mich. Stray"	T	2
Mecosta	Morton	15-14N-8W	Mich. Consolidated Gas Co.	Stickler 1	12,729	11-23	1,279		1,663	"Mich. Stray"	G	1
Mecosta	Wheatland	8-14N-7W	Rex Oil and Gas Co.	Skalitzky & Weller 1	12,171	5-4	3,700	288/3½ hrs.		Dundee	G	1
Montcalm	Cato, east	3-12N-8W	Union Drlg. & Prod. Co.	Douglas 1	11,919	1-9	3,545	135		Detroit River	G	3
Montcalm	Day	36-11N-6W	McClure Drilling Co.	Wicks 1	12,140	5-15	3,337	57		Dundee	G	1
Oceana	Stony Lake	11-13N-18W	Carter Oil Co.	Miller 1	12,742	12-3	1,628	570		Traverse	CD	1
Ottawa	Zeeland	2-5N-14W	Clawson Development Co.	Blauwkamp 1	12,516	9-7	968		1,000	"Berea"	G	3
Roscommon	Headquarters	20-21N-3W	E. V. Hilliard	State E-1	9,395	4-18	1,343		1,000	"Mich. Stray"	G	7
Tuscola	Arbela	33-10N-7E	Fred Riddell	Clark-Lurvey 1	120,28	1-21	2,557	10		Dundee	S	6
Tuscola	Elkland	31-14N-11E	Gordon Oil Co.	Palm Book Land 1	12,217	7-18	2,679	52		Dundee	S	1
Van Buren	Coffee Lake	17-1S-15W	W. D. Gannett	Chamberlain 1	12,344	6-8	1,128	70		Traverse	G	5
Van Vuren	Lacota	10-1S-16W	Ford Oil Co.	Tolles 1	12,175	3-27	1,111	168		Traverse	G	4
				FIELD EXTENSIONS								
Allegan	Monterey	17-3N-13W	Fisher-McCall Oil & Gas, Inc.	Bally 1	12,736	11-26	1,681	20		Traverse		
Allegan	Trowbridge	7-1N-13W	M. Spidel	McCarn 1	12,610	10-1	1,335	15		Traverse		
Isabella	Sherman	29-15N-6W	Chartiers Oil Co.	Diehl 1	11,858	3-10	3,280	68		Traverse		
Isabella	Sherman	29-15N-6W	Chartiers Oil Co.	Merrihew 1	12,125	5-4	1,449		260	"Mich. Stray"		
Ogemaw	Logan	12-22N-3E	Sun Oil Co.	Adams-Walker 1	12,251	5-4	1,461		540	Berea		
Ogemaw	Rose City	11-23N-2E	United Drlrs. & Producers	Anderson 1	11,845	3-45	3,964	19		Detroit River		
Ottawa	New Salem	35-5N-13W	A. J. Boeve	Alphen 1	12,727	11-14	1,653	195		Traverse		
				NEW PAYS PRODUCING FORMATIONS								
Newaygo	Goodwell	8-14N-11W	Pure Oil Co.	Troeger 2	10,357	11-14	3,430	16		Dundee		

* CD—Core drilling.
G—Subsurface geology.
S—Seismograph.
T—Trend.

TABLE III

MICHIGAN OIL FIELDS*

(January 1, 1947)

Field	County	Year of Discovery	Producing Formation	Depth to Prod. Formation (Feet)	API Gravity of Oil	Drilled Acreage	Recovery per Drilled Acre (Barrels)	Production in 1946 (Barrels)	Accumulative Production (Barrels)	No. of Prod. Wells Jan. 1 1947
Adams	Arenac	1937	Traverse	2,025	37.0	830	8,720	1,298,981	7,237,273	66
			Dundee	2,930	34.0					
Akron	Tuscola	1938	Detroit River	3,425	41.9	†	†	21,382	228,483	6
Arbela	Tuscola	1946	Dundee	2,565		60	114	6,844	6,844	6
Ashton	Osceola	1945	Traverse	2,950	42.0	160	399	49,637	63,901	4
			Detroit River	3,645	40.0					
Bangor	Van Buren	1939	Traverse	1,000	29.5	290	1,943	19,666	563,590	15
Beaverton	Gladwin	1934	Dundee	3,880	41.3	240	3,030	19,647	727,307	13
Belly Achers	Montcalm	1944	Dundee	3,470	48.2	240	649	46,572	155,712	4
Bentley	Gladwin	1937	Dundee	3,510	42.1	760	1,406	76,595	1,068,583	30
Bloomer	Montcalm and Ionia	1944	Traverse	2,640	42.3	440	973	196,397	428,004	12
Bloomingdale	Van Buren	1938	Traverse	1,220	42.0	1,380	4,442	59,099	6,129,860	58
Breedsville	Van Buren	1943	Traverse	1,080	33.9	230	1,045	37,539	240,335	17
Brenner	Allegan	1946	Traverse	1,690		170	629	106,952	106,952	17
Casco	Allegan and Van Buren	1940	Traverse	1,100	38.6	60	166	4,742	9,941	6
Cato	Montcalm	1944	Detroit River	3,545				17,845	20,744	3
Cedar	Osceola	1943	Traverse	3,325		360	1,317	62,630	474,006	9
			Dundee	3,810	48.1					
			Detroit River	5,060	46.0					
Chase	Lake	1942	"Berea"	2,466				635	2,237	1
Clare City	Clare and Isabella	1938	"Mich. Stray"	1,320	30.2			4,175	37,502	3
Clayton	Arenac and Ogemaw	1936	Dundee	2,550	34.2	640	6,727	140,675	4,305,178	42
Coffee Lake	Van Buren	1946	Traverse	1,125		50	282	14,121	14,121	5
Coldwater	Isabella	1944	Dundee	3,730	46.0	2,940	893	1,597,831	2,624,178	73
Columbia	Van Buren	1938	Traverse	1,185	39.0	1,100	1,950	40,311	2,155,409	36
Cranberry Lake	Clare	1943	Dundee	3,800				4,530	17,508	1
Crystal	Montcalm	1935	Dundee	3,190	43.5	1,820	4,040	31,625	7,368,757	13
Currie	Isabella	1936	Dundee	3,920	45.9	20	8,387	2,839	167,735	2
Dalton	Muskegon	1940	Traverse	1,845		300	150	13,113	45,042	12
Day	Montcalm	1946	Dundee	3,337	43.0			2,478	2,478	1
Deep River	Arenac	1944	Dundee	2,795		1,000	4,605	2,409,032	4,604,571	100
Deerfield	Monroe	1920	Trenton	2,115	42.7	155	2,848	24,069	441,394	17
Diamond Springs	Allegan	1938	Traverse	1,465	41.0	420	2,021	17,709	848,622	21
Dorr	Allegan	1938	Traverse	1,600	41.0	310	1,070	18,148	331,672	14
Douglass	Montcalm	1945	Dundee	3,400	47.1	120	870	87,322	104,449	6
Dwight	Huron	1945	Detroit River	2,862	36.2			3,614	4,654	1
East Monterey	Allegan	1945	Traverse	1,660				738	9,420	1
East Norwich	Missaukee and Roscommon	1942	Traverse	2,410		1,840	587	439,118	1,079,570	46
			Dundee	3,080						
			Detroit River	4,390						
Edenville	Midland	1938	Dundee	3,790	41.0	350	3,568	22,676	1,248,924	22
Edmore	Montcalm	1933	Traverse	3,150	43.2	90	5,210	9,971	468,890	5
Elba	Gratiot	1946	Traverse	2,440	47.0	80	239	18,984	19,136	4
Elkland	Tuscola	1946	Dundee	2,650				1,546	1,546	1
Enterprise	Missaukee	1943	Detroit River	4,405		120	287	11,421	34,442	3
Esserville	Bay	1944	Dundee	2,835		1,460	531	332,625	774,895	35
Evart	Osceola	1942	Dundee	3,755	47.8	1,100	2,466	310,627	2,713,037	26
Fillmore	Allegan and Ottawa	1943	Traverse	1,525	41.1	640	946	124,913	605,217	57
Fork	Mecosta	1942	Dundee	3,845	50.1	2,550	2,044	1,353,856	5,213,086	61
			Detroit River	5,001	54.8					
Freer	Clare	1946	Detroit River	5,013				8,817	8,817	1
Geneva	Van Buren	1940	Traverse	1,010	31.5	100	473	12,661	47,298	7
Goodwell	Newaygo	1943	Traverse	2,760		1,240	751	100,662	932,457	12
Grout	Gladwin	1940	Dundee	3,825				3,306	32,498	3
Harrison	Clare	1945	Dundee	4,190	39.7			17,535	23,039	2
Hatton	Clare	1941	Dundee	3,945				10,818	120,647	2
Hawkhead	Allegan	1946	Traverse	1,105		140	259	36,338	36,338	11
Headquarters	Roscommon and Clare	1941	Traverse	3,380	42.3	1,580	4,135	226,246	6,533,588	38
			Detroit River	4,955	48.9					
Hilliards	Allegan	1944	Traverse	1,590		320	279	10,588	80,335	10
Hope	Barry	1939	Traverse	1,820	39.9	120	340	15,839	40,833	11
Hopkins	Allegan	1939	Traverse	1,635	41.5	75	1,764	3,122	132,299	3
Kawkawlin	Bay	1938	Berea	1,505	38.0	2,620	1,330	697,208	3,483,430	149
			Dundee	2,830	35.0					

TABLE III—*Continued*

Field	*County*	*Year of Discovery*	*Producing Formation*	*Depth to Prod. Formation (Feet)*	*API Gravity of Oil*	*Drilled Acreage*	*Recovery per Drilled Acre (Barrels)*	*Production in 1946 (Barrels)*	*Accumulative Production (Barrels)*	*No. of Prod. Wells Jan. 1, 1947*
Lacota	Van Buren	1946	Traverse	1,090		60	472	28,302	28,302	4
Lakefield	Saginaw	1937	Dundee	3,185	39.0			917	9,409	1
Leaton	Isabella	1930	Dundee	3,655	43.0	1,060	3,215	103,038	3,407,660	43
Mill Lake	Van Buren	1938	Traverse	1,290	40.0	360	1,332	6,054	479,646	11
Mio	Oscoda	1946	Detroit River	4,180				* 1,480	1,480	1
Monterey	Allegan	1938	Traverse	1,645	37.6	280	1,557	12,864	435,826	18
Mt Haley	Midland	1934	Dundee	3,477	39.6			1,037	35,217	1
Mt. Pleasant	Isabella and Midland	1928	Dundee	3,545	41.8	4,190	5,480	240,265	22,960,500	168
Muskegon	Muskegon	1927	Traverse	1,700	37.4	2,800	2,427	16,108	6,794,466	35
			Dundee	2,025	32.0					
Muskrat Lake	Van Buren	1941	Traverse	1,285	39.2	590	559	20,534	330,066	24
New Salem	Allegan	1938	Traverse	1,625	41.0	970	4,079	122,559	3,957,088	62
North Bangor	Van Buren	1942	Traverse	1,015	32.6	250	1,181	14,409	295,210	4
North Buckeye	Gladwin	1937	Dundee	3,615	39.0	2,750	5,761	212,837	15,842,497	149
North Hamilton	Clare	1943	Dundee	4,078				2,407	10,210	1
Otisville	Genesee	1941	Berea	1,500				2,050	8,196	6
			Traverse	1,894	44.3					
			Dundee	2,449	37.0					
Overisel	Allegan	1938	Traverse	1,490	42.1	1,550	1,537	51,505	2,382,706	67
Pinconning	Bay	1944	Dundee	2,898	36.2			40,404	88,662	1
Pine	Montcalm	1938	Traverse	2,836	45.0			4,683	53,771	1
Pine River	Gratiot	1942	Dundee	3,280				687	10,731	2
Polkton	Ottawa	1942	Traverse	1,890				1,868	6,206	4
Porter	Midland	1933	Dundee	3,415	40.6	4,330	8,064	462,247	34,916,316	225
Prosper	Missaukee	1942	Dundee	3,835	43.2	520	1,715	111,713	891,794	12
Reed City	Osceola and Lake	1940	Traverse	2,925						
			Dundee	3,490		5,270	6,151	3,249,632	32,416,767	191
			Detroit River	3,585	46.3					
Richfield	Roscommon	1941	Detroit River	4,180	43.4	680	499	60,158	339,620	16
Riverside	Missaukee	1942	Dundee	3,944	44.5			3,618	41,309	1
Rockford	Kent	1945	Traverse	2,230	44.0	100	1,146	102,220	114,620	10
Rose City	Ogemaw	1942	Detroit River	4,075	41.2	440	237	37,140	104,153	9
Rose Lake	Osceola	1943	Traverse	3,115	45.4	680	1,313	155,483	893,131	15
Saginaw	Saginaw	1925	Berea	1,825	46.1	1,500	976	16,601	1,404,741	42
Salem	Allegan	1937	Traverse	1,570	38.3	2,110	1,543	64,190	3,255,978	110
Sauble	Lake	1942	Traverse	2,145	35.6	200	395	8,199	79,083	4
Sherman	Isabella	1936	Dundee	3,650	42.0	870	5,046	59,363	4,301,177	32
South Beaverton	Gladwin	1936	Dundee	3,845	41.1	340	1,935	57,087	657,984	22
South Buckeye	Gladwin	1936	Dundee	3,570	39.0	2,040	2,019	73,203	4,118,279	70
South Monterey	Allegan	1944	Traverse	1,660	40.0	150	650	14,201	97,463	12
South Tallmadge	Ottawa	1939	Traverse	1,820	38.6	610	827	48,310	504,328	56
Stony Lake	Oceana	1946	Traverse	1,630	44.9			2,464	2,464	1
Temple	Clare	1938	Dundee	3,885	44.3	2,500	5,802	253,939	14,503,941	88
Trowbridge	Allegan	1937	Traverse	1,355	41.2	550	393	9,122	216,404	11
Vernon	Isabella	1930	Dundee	3,755	44.1	830	5,608	49,230	4,654,312	21
Walker	Kent and Ottawa	1938	Traverse	1,850	40.0	4,845	2,142	263,201	10,376,913	375
Wayland	Allegan	1944	Traverse	1,810				1,055	3,256	2
West Beaverton	Gladwin	1943	Dundee	3,876				1,458	7,132	1
West Branch	Ogemaw	1933	Dundee	2,650	36.8	2,670	2,219	223,021	5,925,485	218
West Hopkins	Allegan	1941	Traverse	1,580		310	1,244	3,013	385,486	8
Wheatland	Mecosta	1945	Dundee	3,690	43.0			30,288	33,547	1
Winfield	Montcalm	1936	Dundee	3,340	43.2			1,741	57,790	4
Winterfield	Clare	1940	Traverse	3,105						
			Dundee	3,770	44.2	1,000	3,824	171,859	3,823,841	33
			Detroit River	5,015						
Wise	Isabella	1938	Dundee	3,700	45.2	1,500	1,686	202,489	2,529,609	64
Woodville	Newaygo	1943	Traverse	2,820		280	676	28,929	189,334	7
Wyoming Park	Kent	1939	Traverse	1,880				6,425	134,963	11
Yost-Jasper	Midland	1932	Dunee	3,420	40.6	2,010	3,854	186,058	7,747,187	81
Zeeland	Ottawa	1942	Traverse	1,495	41.9	680	331	22,596	224,884	7
Miscellaneous								3,728	510,328	24
Total State								17,074,518	256,946,262	3,520

* Fields which are abandoned or have produced less than 500 barrels during 1946 are not included.

† Drilled acreage and recovery per drilled acre are not calculated for fields in which wells are too few or scattered to be significant.

on a core-test high, found gas at a depth of 5,038 feet in a sand bed in the basal Detroit River formation. The well was deepened to 5,307 feet, into the Sylvania formation, found water, and was plugged back to 5,070 feet. After perforation the well gauged 26,539,000 cubic feet of gas per day. Shut-in pressure after 4

TABLE IV

MICHIGAN GAS FIELDS

(January 1, 1947)

Field	*County*	*Year of Discovery*	*Producing Formation*	*Depth to Prod. Formation (Feet)*	*Drilled Acreage*	*Recovery per Drilled Acre (M. Cu. Ft.)*	*Production in 1946 (M. Cu. Ft.)*	*Accumulative Production (M. Cu. Ft.)*	*No. of Prod. Wells Jan. 1, 1947*
Big Rapids	Mecosta	1943	"Mich. Stray"	1,145	1,440	316	422,118	454,325	9
Broomfield	Isabella	1930	"Mich. Stray"	1,350	6,800	1,607	557,951	10,924,249	56
Cedar	Osceola	1945	"Mich. Stray"	1,490	320	35	11,257	11,257	2
Clare City	Clare	1938	"Mich. Stray"	1,290	720	2,252	113,335	1,621,110	7
Clayton	Arenac	1936	Berea	1,180	1,440	3,465	264,875	4,989,470	22
Coldwater	Isabella	1945	"Mich. Stray"	1,390	2,400		1,890,299*	1,890,299*	15
Colfax	Mecosta	1945	"Mich. Stray"	1,240	640	490	184,780	313,904	4
Cranberry Lake	Clare	1943	"Mich. Stray"	1,295	6,240	705	2,035,503	4,396,686	39
Crystal	Montcalm	1935	"Mich. Stray"	1,000	360	2,091	89,868	753,290	5
Deep River	Arenac	1926	Berea	1,490	1,280	1,158	289,090	1,482,237	10
Douglas	Montcalm	1943	"Mich. Stray"	1,190	640	136	68,925	87,420	3
Edmore	Montcalm	1936	"Mich. Stray"	1,300	4,560	1,365	272,769	6,224,485	14
Evart	Osceola	1941	"Mich. Stray"	1,440	4,960		830,724*	3,265,198*	28
Freeman	Clare	1939	"Mich. Stray"	1,475	2,040	1,781	448,272	3,633,246	11
Fremont	Isabella	1941	"Mich. Stray"	1,235	640	482	33,363	308,439	3
			Stray	1,500					
Garfield	Clare	1946	Detroit River	5,013	800		261,608*	261,608*	5
Goodwell	Newaygo	1943	"Mich. Stray"	1,135	2,720	1,166	1,426,908	3,171,593	20
Harrison	Clare	1945	"Mich. Stray"	1,075	800	50	40,397	40,397	5
Ithaca	Gratiot	1943	"Mich. Stray"	900	800	665	256,851	532,184	4
Lincoln	Clare	1938	"Mich. Stray"	1,530	2,520	2,829	1,359,766	7,130,442	30
Marion	Clare & Osceola	1940	"Mich. Stray"	1,370	10,400	1,479	2,799,757	15,383,129	94
Muskegon	Muskegon	1927	Traverse and Detroit River	1,640	1,200		15,165*	7,176,249*	8
North Star	Gratiot	1940	"Mich. Stray"	870	160	1,118	24,106	178,845	1
Reed City	Osceola & Lake	1940	"Mich. Stray"	1,220	4,480		4,528,079*	18,382,465*	30
Richland	Montcalm	1940	"Mich. Stray"	1,205	960	746	142,394	716,157	4
Riverside	Missaukee	1940	"Mich. Stray"	1,435	2,720	1,088	462,021	2,958,014	15
Salem	Allegan	1941	Salina	2,725			5,371	106,071	1
Shaver	Gratiot	1935	"Mich. Stray	1,020	2,600	3,238	578,376	8,418,891	36
Six Lakes	Mecosta & Montcalm	1934	"Mich. Stray"	1,270	9,760	4,695	2,512,219	5,821,743	106
Sylvan	Osceola	1941	"Mich. Stray"	1,525	320	246	2,103	78,713	1
Vernon	Isabella	1930	"Mich. Stray"	1,300	760	1,904	5,274	1,446,763	1
		1939	Berea	1,150					
Walker	Kent	1940	Detroit River	2,250			37,941	4,138,668*	3
			"Mich. Stray"	1,495					
West Fork	Mecosta & Osceola	1943	Detroit River	5,001	2,400	336	538,519	805,460	15
Winfield	Montcalm	1935	"Mich. Stray"	1,125	3,040	1,343	397,574	4,084,557	13
Wise	Isabella	1940	"Mich. Stray"	1,250	1,120	1,235	140,033	1,383,622	8
Woodville	Newaygo	1943	"Mich. Stray"	1,185	2,080	682	576,386	1,419,221	12
Miscellaneous							150,428	23,040,108	126
Total State							23,774,495	187,039,515	766

* Includes dry and oil-well gas. Recovery per drilled acre not calculated.

hours was 1,950 pounds per square inch. On production tests, at the rate of 1,656,000 cubic feet of gas per day, the well made 101 barrels of condensate per 1,000,000 cubic feet of gas. Four dry holes were subsequently drilled in the area; one had appreciable gas. Two of the wells failed to find sand, indicating that the "Freer" sand is lenticular and probably of small extent.

FIELD DEVELOPMENT

The Deep River field, Arenac County, and the Coldwater field, Isabella County, both 1944 discoveries, were the most active of the older oil fields. The drilled area of the Deep River field was increased to 1,000 acres by the addition of 37 new wells. Sixteen new wells were drilled in the Coldwater field, enlarging it to 2,940 acres. In southwestern Michigan, only one of the older fields was active, the Rockford field, Kent County, a 1945 discovery. Seven new wells were drilled in the field.

NATURAL GAS

The number of gas well completions was greater in 1946 than in any year since 1936. Altogether, 139 gas wells were drilled. Of these, however, 76 were facility wells. All except 13 of the new gas wells were in the "Basin," and more than 90 per cent of the gas production was from this district. Gas production for the year was 23,774,495,000 cubic feet, an increase of 475,947,000 cubic feet over 1945.

DISCOVERIES

Six gas fields were discovered during 1946 (Table II). Of these, only Headquarters, Roscommon County, had appreciable development. At the end of the year 7 wells had been drilled in the field and 1,120 acres proved.

DEVELOPMENT

More than half of the gas-well completions, 76 of the 139, were facility wells. A facility well is defined as one which is capable of producing gas but does not add to the state's reserves. The name applies to those wells drilled in storage reservoirs, in fields being prepared for storage, or in old fields, to more adequately produce the remaining gas.

In the Austin field, Mecosta County, a storage reservoir since 1942, 19 facility wells were drilled. Fields being prepared for storage during the year were: Marion, Clare, and Osceola counties, with 33 facility wells; Reed City, Osceola and Lake counties, with 7 wells; and Goodwell, Newaygo County, with 3 wells. Fourteen wells were drilled in the Lincoln field, Clare County, on a closer spacing pattern than previously drilled in the field to more adequately produce the remaining gas.

The Panhandle Eastern Pipe Line Company revived interest in the Howell area, Livingston County, with the completion of its McPherson No. 1, Sec. 35, T. 3 N., R. 4 E. This well was completed on October 21, 1946, at a depth of 3,907 feet with a potential open flow of 6,407,000 cubic feet of gas per day. Production is from the basal Salina formation. The McPherson well is approximately $\frac{3}{4}$ mile south of one drilled by the Talbot Oil Company in 1935 on the same farm. That well was drilled to 5,958 feet, into the St. Peter sandstone, and was plugged back to 3,959 feet in the basal Salina, where it was completed with an initial potential open flow of 441,000 cubic feet per day. Excepting occasional tests, the

well has been shut in. A second well was being completed by Panhandle at the close of the year.

EXPLORATION

The results of exploratory drilling and the basis for locating the exploratory wells in 1946 are shown in Table V.[3] The classification of exploratory wells described by F. H. Lahee is used in this table. It will be noted that geological methods were the bases for locating 74 per cent of the wells and that these wells comprised 93 per cent of the successful wells. Geophysical methods, seismic, were

TABLE V
EXPLORATORY WELLS—1946

Type of Well	*Total Wells*	*Basis for Locating Well*						*Footage*
		Subsurface Geology	*Trend*	*Core Drill*	*Seismograph*	*Non-Technical*	*Unknown*	
New-field wildcats								
Successful	16	9	3	2	2			36,142
Dry	223	86	51	20	8	9	49	535,683
Totals	239	95	54	22	10	9	49	571,825
New-pool wildcats								
Dry	12	5	6				1	21,985
Deeper-pool tests								
Dry	7	7						13,807
Shallower-pool tests								
Successful	1	1						1,222
Outposts								
Successful	10	6	3	1				25,591
Dry	57	17	24	2	1	4	9	117,278
Totals	67	23	27	3	1	4	9	142,869
All exploratory wells								
Successful	27	16	6	3	2			62,955
Dry	299	115	81	22	9	13	59	688,753
Totals	326	131	87	25	11	13	59	751,708
Success percentage	8.3	12.2	7.1	12.0	18.2	0.0	0.0	

responsible for about 4 per cent of the locations and the remaining 7 per cent of successful wells.

Core-drill permits dropped from 203 in 1945 to 186 in 1946. Western Michigan ranked first in core-drilling activity with 108 permits, the remaining core tests were about equally divided among the "Basin," eastern Michigan, and northern Michigan districts.

Geophysical work was limited to 47 seismograph crew weeks in 1946, compared with 107 seismograph crew weeks in 1945. Work during the year was carried on in the southern part of the "Basin" and northern part of the "Thumb."

The basal Detroit River (Devonian) or older formations were reached in 28 exploratory holes (Table VI). Four of these tests were drilled in old pools which

[3] Data for table furnished by Glenn C. Sleight, Sun Oil Company, Mt. Pleasant, Michigan, member of the Committee on Statistics of Exploratory Drilling.

produce from younger formations. Only one test was drilled as deep as the Trenton formation.

SECONDARY RECOVERY

Two secondary-recovery projects were initiated by the Sun Oil Company during the year. In the East Norwich oil field, Missaukee and Roscommon counties, construction was started on a compressor plant. Plans are to use oil well gas to repressure the field. Production is from the "Richfield" zone in basal Detroit River formation (Devonian).

TABLE VI
DEEP TESTS

County	*Well*	*Section Township Range*	*Permit Number*	*Total Depth (Feet)*	*Oldest Formation Penetrated*
Arenac	Ward Oil Co.—Petty 1	18-19N-7E	11,976	4,300	Sylvania (Dev.
Bay	R. Steinhorst—Bishop 1	1-16N-4E	12,399	3,800	Detroit River (Dev.)
Clare	P ire Oil Co.—Freer 1	1-17N-6W	11,833	5,307	Sylvania (Dev.)
Clare	Pure Oil Co.—Marble A 1	18-17N-6W	12,698	5,121	Detroit River (Dev.)
Clare	Pure Oil Co.—Mulder 1	18-17N-6W	12,376	5,124	Detroit River (Dev.)
Crawford	McClanahan Oil Co.—Starr 1	30-25N-1W	11,807	5,215	Bass Island? (Sil.)
Huron	Pure Oil Co.—Schreiber 1	7-15N-10E	12,508	4,450	Sylvania (Dev.)
Huron	Pure Oil Co.—Stapleton 1	22-17N-15E	11,834	5,702	Cabot Head? (Sil.)
Huron	C. W. Teater—Bleicher 1	20-18N-13E	12,546	3,377	Sylvania (Dev.)
Iosco	R. W. Matlock—Johnson 1	1-22N-8E	12,163	3,955	Sylvania (Dev.)
Isabella	Roosevelt Oil Co.—Gibon 1[1]	12-14N-3W	12,411	4,805	Sylvania (Dev.)
Livingston	Panhandle Eastern—McPherson 1	35-3N-4E	12,603	3,907	Salina (Sil.)
Mason	Superior Oil Co.—Barothy 1	22-17N-16W	12,413	3,143	Sylvania (Dev.
Missaukee	Freeman Oil Co.—Smith 1	8-24N-7W	12,431	4,520	Detroit River(Dev.)
Montmorency	E. R. Morris—Carrier 1	30-30N-4E	10,914	2,300	Detroit River (Dev.)
Montmorency	E. R. Morris—Wiggins 1	29-30N-4E	11,632	2,952	Bass Island (Sil.)
Newaygo	Pure Oil Co.—Troeger 1[2]	8-14N-11W	10,356	4,342	Detroit River (Dev.)
Oceana	Carter Oil Co.—Newman 1	21-14N-18W	11,936	3,008	Salina (Sil.)
Oceana	C. W. Teater—Ryan 2	16-16N-16W	12,194	3,843	Salina (Sil.)
Osceola	Pure Oil Co.—Zimmerman A 1	12-17N-7W	12,375	5,292	Sylvania (Dev.)
Osceola	Sohio Petroleum Co.—Buxton 1	13-17N-7W	12,385	5,112	Detroit River (Dev.)
Osceola	Sun Oil Co. Wilcox & Schoenhals 1[3]	27-18N-8W	12,173	5,292	Sylvania (Dev.)
Oscoda	Ohio Oil Co.—Mio 1	30-25N-3E	11,995	5,133	Bass Island (Sil.)
Oscoda	Ohio Oil Co.—Mio 2	22-25N-2E	12,242	4,253	Detroit River (Dev.)
St. Clair	Sterling Oil & Gas—Toodzio 1	13-8N-16E	12,035	4,267	Richmond (Ord.)
Tuscola	Gordon Oil Co.—Palm Book 1	31-14N-11E	12,317	3,735	Detroit River (Dev.)
Tuscola	Smith Petroleum—Partlo 1[4]	28-14N-8E	9,036	3,685	Detroit River (De ▲ .)
Wayne	Union Drlg. & Prod.—Angell 1	7-1S-8E	12,589	4,288	Trenton (Ord.)

[1] Deep-pool test—Mt. Pleasant oil field.
[2] Deep-pool test—Goodwell oil field.
[3] Deep-pool test—Evart oil field.
[4] Deep-pool test—Wisner oil field.

In the Edenville oil field, Midland County, a Dundee well was abandoned as a producer and converted to a brine input well for the purpose of water-flooding the Dundee (Devonian) pay. Casing in the well was perforated opposite the Marshall sandstone (Mississippian) and brine allowed to go into the Dundee limestone under hydrostatic head. Impurities in the brine, however, sealed off the Dundee in a short time and it was necessary to abandon this phase of the project. Plans at the end of the year called for pumping the Marshall brine to the surface, treating to remove impurities, and using another input well for flooding.

CONCLUSIONS

Although the results of exploratory drilling in 1946 were on the whole disappointing, Western Michigan, an area hitherto relatively untested, was opened to

more intensive exploration and development by the Carter Oil Company's discovery of the Stony Lake oil field. Other core-test structural highs in this district, and also in the "Basin" and northern Michigan, which have been found by core-drilling programs during the past 2 years, will probably be tested this year. The reopening of the Howell area by Panhandle Eastern Pipe Line Company should revive interest in development in southeastern Michigan.

The outlook for 1947 is for an increased number of exploratory wells with prospects of more significant discoveries than during the past 2 years.

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DEVELOPMENTS IN NORTH MID-CONTINENT IN 1946[1]

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ABSTRACT

Several potentially important widely scattered wildcat discoveries near the close of the year featured a rather quiet period of exploration and development in Kansas. Each of these discoveries, located in Kingman, Barber, Harvey, and Ellis counties, either gives promise of prolific production or is in an area in which a pool of more than average size may be developed. These discoveries have served as a stimulus to additional exploratory work in the vicinity of each well and many additional tests are being planned for 1947. In addition, there was the usual number of small pools or further extensions on the relatively shallow Central Kansas uplift. These pools were found mainly in Rooks, Ellis, Rush, and Barton counties.

There were no important developments and very little drilling in Nebraska, Missouri, and Iowa in the year.

Kansas produced 98,193,272 barrels of crude oil and casinghead gasoline in 1946, slightly less than the production for 1945. Gas production amounted to 122,600,000,000 cubic feet. Development of the huge Hugoton gas field in the southwestern part of the state continued at a rapid rate, but the increased runs from that field did not make up for the decline in gas production from the older fields. Many of the marginal wells in the Hugoton field have no outlet at present.

Return to closer spacing in the development of Kansas fields is reflected in the dry-hole percentage of all wells drilled of 32.2 per cent compared with the figure of 41.5 per cent for 1945 and 50.5 per cent for 1944 when nearly all wells were located on a 40-acre basis.

INTRODUCTION

The area covered in this summary includes the states of Kansas, Nebraska, Missouri, and Iowa. That part of Kansas covered by the scouts in the Wichita check meeting is included. Since a more restricted area has been treated in previous reports on the North Mid-Continent, statistics in this report are not exactly comparable with those published last year.

KANSAS

DRILLING ACTIVITY

A continued increase in drilling for gas in the large Hugoton field was only in part responsible for the increase in total completions from 1,482 to 1,942. More oil wells were completed and an encouraging decrease in the dry-hole percentage was experienced. This percentage of 32.2 per cent is comparable with the figure of 41.5 per cent in 1945 and 50.5 per cent in 1944. More fruitful results are due largely to the closer spacing of wells and the drilling of fewer tests by inexperienced operators. Comparative figures for the past 3 years are shown in Table I.

Productivity of new oil-well completions declined again for the sixth consecutive year. This is indicative of an area which is in the more advanced stage of development and exploitation. The Central Kansas uplift, which includes most of

[1] Manuscript received, April 16, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Darby and Bothwell, Inc.

[3] Gulf Oil Corporation.

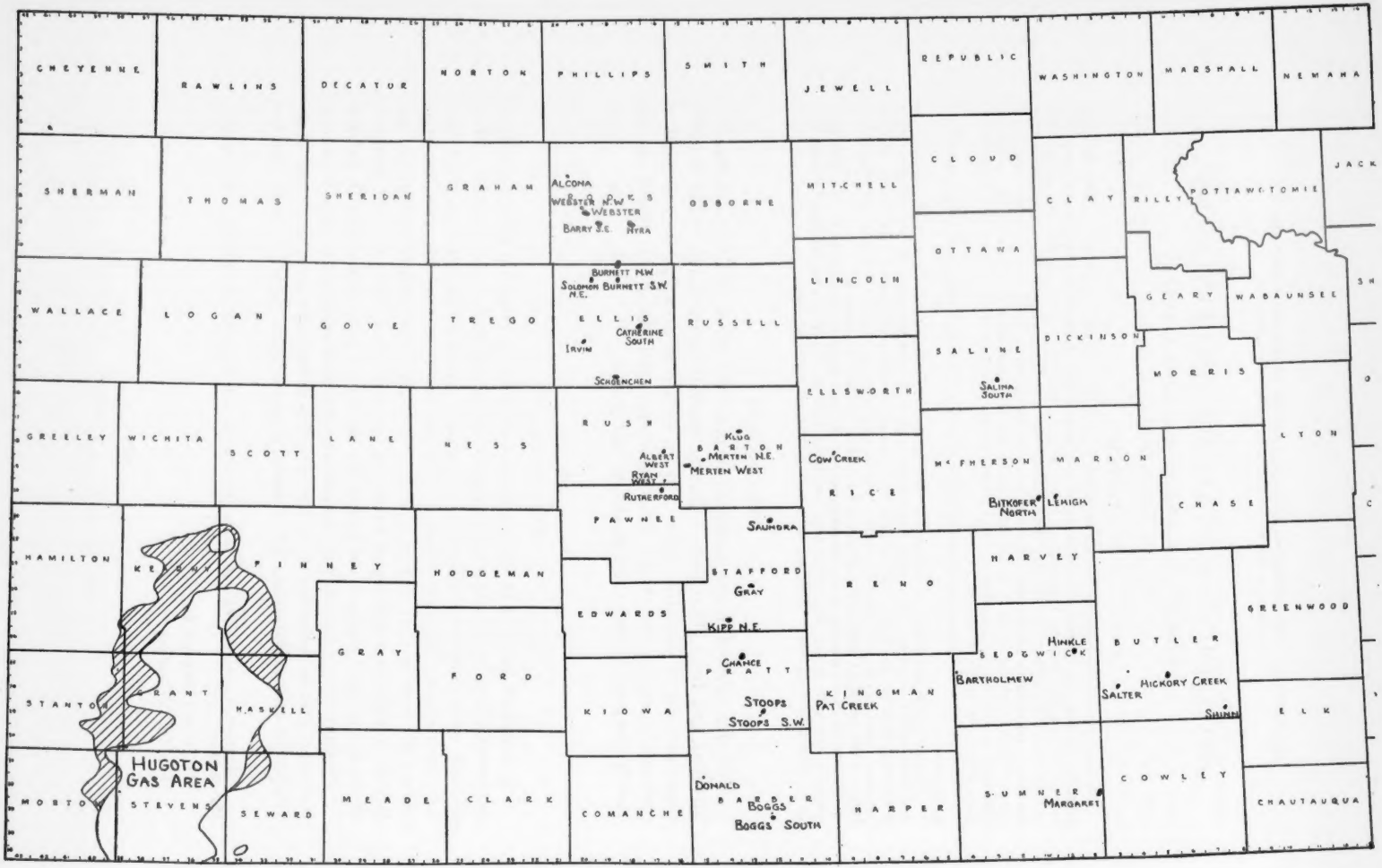

FIG. 1.—Map showing 1946 discoveries and discovery wells in process of completion at end of year in north Mid-Continent.

the development area of the state, is in this stage, but many minor extensions of old fields and pools are being made and will continue to be made in future years. There were no outstanding discoveries or extensions of the generally considered "oil country" during the past year, although some important discoveries at the close of the year gave hope of finds of more than average caliber. These are discussed under the heading of new pools.

The decline in average productivity of gas well completions is due in part to ambitious attempts to enlarge the periphery of the Hugoton field in the south-

TABLE I

	1946	*Percentage*	*1945*	*Percentage*	*1944*	*Percentage*
Oil wells	1,029	53.0	659	44.5	716	44
Gas wells	286	14.8	208	14.0	90	5.5
Dry holes	627	32.2	615	41.5	823	50.5
	1,942		1,482		1,629	

western part of the state. These attempts for the most part were successful, but the initial production of the wells were small and results were somewhat disappointing. Many of the wells were completed as commercial producers only after exceptionally large treatments with acid. It has been estimated that about 30,000 acres were added to the proved area of the Hugoton field during 1946. This area is shown on Figure 1 by hatched lines. Development of the gas reserves of Pratt and Barber counties made up most of the other gas activity.

TABLE II

Year	*Oil Wells*	*Barrels Potential*	*Barrels Average Potential*	*Gas Wells*	*Capacity in Cubic Feet*	*Average Capacity in Cubic Feet*
1941	1,253	1,727,593	1,379	75	797,011,000	10,626,000
1942	713	788,193	1,106	89	610,769,000	6,862,572
1943	796	716,777	900	30	320,420,000	10,680,667
1944	716	481,315	672	90	1,255,123,000	13,945,800
1945	659	298,390	453	208	2,957,170,000	14,217,163
1946	1,029	372,485	362	286	3,261,500,000	11,400,000

LEASING ACTIVITY

So many of the new oil pools were found in counties that were already heavily leased that these discoveries for the most part did not cause active lease plays. However, discoveries in Barber County were attended by some increased activity in it and adjoining counties. Continued exploration and exploitation on the Central Kansas uplift, principally in Rooks, Ellis, and Rush counties, resulted in renewal of many expiring leases, often at bonus prices above those previously considered as the going price. In fact, one of the chief results of developments in Kansas during the year was the increase in the price of leases in favorable wildcat areas. Many leases were taken at three to five dollars per acre in areas in which previously one dollar was considered the top price. Large amounts of acreage were taken on the fringe of the Hugoton gas field.

Fig. 1.—Map showing 1946 discoveries and discovery wells in process of completion at end of year in north Mid-Continent.

PRODUCTION

Kansas produced 98,193,272 barrels of crude oil and casinghead gasoline in 1946 compared with 98,429,869 barrels in 1945 and the all-time peak of 108,441,648 barrels in 1943. Gas production amounted to 122,600,000,000 cubic feet, about 1,500,000,000 cubic feet less than the previous year. Decline in the production of the older gas fields was greater than increased take from the expanding Hugoton field of southwestern Kansas.

The value of crude oil and casinghead gasoline produced in Kansas in 1946 has been estimated at $132,602,045.80 by officials of the State Corporation Commission. Gas sales amounted to $6,743,000.

For the first 2 months of 1946, the allowable for Kansas was set at 255,000 barrels daily. This was reduced further to 250,000 barrels for March, April, and May, but increased demand caused it to be raised to 260,000 barrels for June. Allowable for the last 6 months of the year was set at 270,000 barrels, and this figure was in effect for the first quarter of 1947. It is expected that increased demand will result in larger allowables for the rest of the current year.

The total potential of all wells in the state at the beginning of 1946 was 3,805,107 barrels, but this had fallen to 3,258,296 at January 1, 1947. The all-time high potential of 8,201,960 barrels was established in March, 1942. The decline curve of the state-wide potential has flattened and indicates the staying qualities of many producing leases and pools. Surprising recoveries have been secured from many leases, especially those producing from Arbuckle dolomite, which have never had allowables of more than 75 or 80 barrels per well per day. This production record is a tribute to the judgment of those operators and companies who have refused to pull on their wells heavily.

WILDCATTING

Wildcat drilling in Kansas did not increase with the national trend in 1946. This is especially true of "rank wildcatting," which was indulged in more by the major companies than by the independent operators who otherwise occupy a strong position in the Kansas oil picture. There was an increase in the drilling of outpost wells and this undertaking in search of oil was largely that of independent operators encouraged by major company support. The completion of 29 gas "outposts" around the fringe of the Hugoton field is largely responsible for the increase in the number of this type of exploratory wells, but was largely done by major companies.

As shown in Table III, 430 exploratory wells of all types were drilled in 1946, compared with 447 tests in 1945. Total footage drilled was less than the total footage of 1,634,702 feet in 1945. The average footage in 1946 was 3,466 feet per well, comparable with 3,657 feet in the previous year.

However, as shown in Table IV, drilling of field and pool wildcats declined to the lowest figure since 1941. It is worthy of note that the average depth of these more venturesome exploration wells was 3,602 feet. This figure seems surprisingly

TABLE III

	Total	*Oil*	*Feet*	*Gas*	*Feet*	*Dry*	*Feet*	*Total Footage*
New-field tests	225	15	52,870	2	8,904	208	763,676	825,450
New-pool tests	89	18	64,380	0	0	71	241,224	305,604
Outposts	106	20	67,867	29	91,655	57	198,204	357,726
Deeper-pool tests	2	2	1,610	0	0	0	0	1,610
Shallower-pool tests	8	7	0	1	0	0	0	0
	430	62	186,727	32	100,599	336	1,203,104	1,490,390

low considering that several 8,000-foot tests were drilled in the southwestern part of the state, but they were few compared with the large number of tests to 3,300–3,500 feet in Rice, Barton, Ellis, and Rooks counties.

TABLE IV

Year	*Oil and Gas Wells*	*Total Feet*	*Dry Holes*	*Total Feet*	*Total Wells*	*Total Feet*
1938	43	148,050	129	478,389	172	626,439
1939	21	67,259	74	258,031	95	325,290
1940	23	75,142	122	408,887	145	484,020
1941	37	140,284	290	688,189	327	828,473
1942	34	122,041	299	1,039,753	333	1,161,794
1943	57	199,532	379	1,416,605	436	1,616,137
1944	66	256,376	428	1,586,558	494	1,842,737
1945	39	141,999	326	1,204,832	365	1,346,831
1946	35	126,154	279	1,004,900	314	1,131,054

NEW POOLS

Table V lists new pools in western and eastern Kansas in 1946, as named by the nomenclature committee of the Kansas Geological Society. Two of the 35 discoveries have now been joined with old pools. Three revive abandoned pools. At the year's end there were 17 new discoveries with only one well. The extensive Hugoton gas field in the southwest part of the state experienced one of its most active years. Figure 1 shows the amountof extension developed in this field during the year as shown by the hachured area. The more important areas are discussed.

Barber County.—The Boggs pool and its $\frac{3}{4}$-mile extension during the year, Boggs South, appears to be one of the most promising discoveries since the Chitwood Simpson sand pool was discovered in 1943. The discovery was made by subsurface, but the extension was influenced by the core drill. The pay zone is friable Simpson sand with a relatively thick gas cap. Considerable development is anticipated during the coming year in this area.

Ellis County.—One of the most active areas in the state was Ellis County. Operators were reasonably successful, as shown by the 4 discoveries. Two of these areas may well be important discoveries. They are Schoenchen in T. 15 S., R. 18 W., and Catherine South in T. 13 S., R. 17 W.

Pawnee and Rush counties.—Brack and Huber's discovery well in the Rutherford pool in Sec. 8, T. 20 S., R. 16 W., was not a large well, but its position from the Ryan, Behrens, and Pawnee Rock pools undoubtedly will cause considerable development in this Arbuckle limestone producing area. Progress was made in

this area toward the construction of a compressor plant to handle Arbuckle sour gas produced in quantities with the oil.

At the close of the year there were 3 wildcats which gave promise of being important discoveries. They were Skelly's Allen No. 1, Sec. 22, T. 11 S., R. 19 W., and Continental's Warren No. 1, Sec. 3, T. 11 S., R. 18 W., both of which had temporary potentials from the Arbuckle. These tests are located near the Burnett

TABLE V

Pool	*County*	*Sec.-T.-R.*	*Total Depth (Feet)*	*Producing Formation*	*Method of Exploration*	*Potential (Barrels)*
			WESTERN KANSAS POOLS, 1946			
Albert W.	Rush	28-18S-16W	3,644	Basal sand	Subsurface	25
Alcona	Rooks	14- 7S-20W	3,539	Arbuckle	Subsurface	18
Barry SE.	Rooks	13- 9S-19W	3,484	Arbuckle	Subsurface	3,000
Bittikoffer N.	McPherson	25-19S- 1W	3,420	"Miss. lime"	Subsurface	20
Boggs	Barber	17-33S-12W	4,844	Simpson	Subsurface	2,303,000 gas
Boggs S.	Barber	21-33S-12W	4,803	Simpson	Core drill	1,405
Burnett SW.	Ellis	22-11S-18W	3,637	Arbuckle	Subsurface	205
Catherine S.	Ellis	15-13S-17W	3,583	Arbuckle	Subsurface	559
Chance	Pratt	4-27S-13W	4,485	Arbuckle	Subsurface	203
Cheney	Sedgwick	30-27S- 4W	3,737	"Miss. lime"	Subsuface	5,000,000 gas
Cow Creek	Rice	28-18S- 9W	3,255	Arbuckle	Subsurface	100
Donald	Barber	33-31S-15W	5,167	"Miss. lime"	Core drill	2,500,000 gas
Gray	Stafford	11-24S-13W	3,882	Lans.-K.C.	Subsurface	480
Irvin	Ellis	6-14S-19W	3,874	Arbuckle	Seismic	400
Kipp NE.	Stafford	23-25S-14W	4,303	Lans.-K.C.	Subsurface-seismic	1,260
Klug	Barton	28-17S-13W	3,421	Arbuckle	Subsurface	52
Merten NE.	Barton	36-18S-15W	3,502	Arbuckle	Non-technical	100
Merten W.	Barton	8-19S-15W	3,584	Basal sand	Seismic	116
Nyra	Rooks	16- 9S-17W	3,547	Lansing	Seismic	38
Rutherford	Pawnee	8-20S-16W	3,823	Arbuckle	Seismic	128
Ryan W.	Rush	33-19S-16W	3,758	Arbuckle	Seismic	31
Salina S.	Saline	32-14S- 2W	3,252	Viola	Subsurface	91
Saundra	Stafford	14-21S-12W	3,602	Arbuckle	Non-technical	70
Schoenchen	Ellis	21-15S-18W	3,574	Arbuckle	Subsurface-seismic	248
Stoops	Pratt	7-29S-12W	4,731	Viola	Subsurface	793
Stoops SW.	Pratt	24-29S-13W	4,490	Viola	Subsurface	164
Webster	Rooks	27- 8S-19W	3,409	Arbuckle	Subsurface	2,549
Webster NW.	Rooks	21- 8S-19W	3,450	Arbuckle	Subsurface	218
			EASTERN KANSAS POOLS, 1946			
Hickory Cr.	Butler	11-28S- 5E	2,738	Bartlesville	Subsurface	100
Hinkle	Sedgwick	1-27S- 1E	2,905	Sooy-cong.	Subsurface	828
Lehigh	Marion	27-19S- 1E	2,843	"Miss. lime"	Core drill	11
Margaret	Sumner	36-32S- 2E	3,473	Arbuckle	Subsurface	40
Salter	Butler	23-28S- 3E	2,098	Simpson	Subsurface	40
Silver City	Woodson	19-26S-15E	1,529	Bartlesville	Unknown	30
Shinn	Butler	19-29S- 8E	2,773	"Miss. lime"	Non-technical	30

and Riverview fields and no doubt will stimulate activity in northern Ellis County. The third test was Plains Exploration's Swander No. 1, Sec. 20, T. 28 S., R. 9 W., Kingman County, which flowed oil in a drill-stem test from the Viola dolomite. The performance of this test has already touched off a strong lease play.

MISSOURI AND IOWA

There were no new important discoveries in Missouri during the year. Table VI lists the wildcats drilled in the state.

The Tarkio field, discovered and entirely owned by the Cities Service Oil Company, had 8 wells producing at the end of the year with 2 producers abandoned. The wells produce from a Cherokee sand at an average depth of 1,415 feet.

TABLE VI

County	*Sec.-T.-R.*	*Operator and Farm*	*Total Depth (Feet)*	*Formation*	*Method*
Vernon	21-36N-31W	Ward—Cartwright 1	713	"Mississippi lime"	Chance
Vernon	21-37N-32W	Waymire—Stubblefield 1	2,325	Granite	Chance
Cass	29-46N-32W	Walters—Pichering 1	2,572	Granite	Chance
Caldwell	30-55N-29W	Todd—Benson 1	1,306	"Mississippi lime"	Chance
Atchison	15-65N-40W	Short—Griffen 1	1,385	Pennsylvanian sand	Chance
Nodaway	10-65N-36W	Palensky—Wallace 1	2,211	Hunton	Chance

The 1946 production totaled 17,306 barrels and total production at the end of the year was 66,862 barrels. Daily production as of January 1, 1947, was 49 barrels a day.

No tests were drilled for oil or gas in Iowa as far as is known.

NEBRASKA

No new pools were found in Nebraska during 1946. There was an increase in the number of wildcats in western Nebraska, but there was no wildcatting in eastern Nebraska in 1946. During the year the Amerada Petroleum Corporation completed its exploration of the Chadron anticline area with the completion of its Geyser No. 1 in Sec. 10, T. 34 N., R. 54 W., Sioux County. The test, like its predecessors, was drilled to the pre-Cambrian granite found at the depth of 4,561 feet. Amerada's exploration of this vast area was well planned and thorough. After nearly 2 years of geophysical exploration, 7 tests were drilled on extensive but widely scattered blocks of acreage and all but one test was drilled to the pre-Cambrian. Four of the 7 tests were drilled in South Dakota between Chadron and the Black Hills.

Table VII gives a summary of Nebraska wildcats in 1946.

TABLE VII

1946 WESTERN NEBRASKA WILDCATS

County	*Sec.-T.-R.*	*Operator and Farm*	*Total Depth (Feet)*	*Formation*	*Method*
Furnas	25- 4N-21W	Stanolind—Bruntz 1	3,646	Pre-Cambrian schist	Core drill
Gosper	34- 5N-21W	Stanolind—Schoen 1	3,547	Pre-Cambrian granite	Core drill
Sioux	10-34N-54W	Amerada—Geyser 1	4,561	Pre-Cambrian granite	Seismograph
Holt	32-33N-11W	Wynn—Mallory 1	905	Lakota	Chance
Red Willow	32- 3N-29W	Wilcox—Hollingsworth 1	2,183	Stone Corral	Chance

The following is the 1946 and cumulative production to December 31, 1946, for southeastern Nebraska.

	No. Wells Now Producing	*Production 1946 (Barrels)*	*Cumulative to End 1946 (Barrels)*
Barada	11	82,631	934,623
Dawson	4	22,869	159,662
Falls City	36	171,947	3,909,853
Schubert (revived)	1	5,475	113,282
	52	282,922	5,117,420

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DEVELOPMENTS IN OKLAHOMA IN 1946[1]

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ABSTRACT

Oklahoma produced 136,807,000 barrels of crude oil in 1946, a decline of 2,420,000 barrels from 1945. Reserves are reported as 898,186,000 barrels; 8,347,000 above last year.

Development and exploration drilling exceeded last year. More than 3,000 wells were drilled. Of this number, exploration accounted for 588 wells, discovering 71 oil pools, 22 gas pools, 18 extensions, and 3 new producing formations in old pools. The large number of fields placed the state high in the column of new proved reserves.

The most promising discovery was the Southwest Antioch pool in Garvin County, T. 3 N., R. 2 W., discovered by Globe-Vickers' Gibson No. 1, in the center of SE. ¼, NE. ¼ of Sec. 30.

Geophysical activity in the state has kept pace with former years, and a notable shift has taken place in the numbers doing work in the Anadarko basin.

INTRODUCTION

While the Nation increased its production of oil 37,000,000 barrels over the preceding year, Oklahoma's production declined 2,420,000 barrels and lost third position among the producing states. Although there was an increase in all types of well completions in the state, reserves in new pools did not equal production; however, the state maintains fourth place in the reserve column of producing states.

PRODUCTION[3]

Oklahoma produced 136,807,000 barrels of crude oil in 1946, a decrease of 2,420,000 barrels from the 1945 production of 139,227,000. This is a decrease of 1.7 per cent as compared with a national increase of 2.2 per cent. The decrease in production can be accounted for by the cut back in production from the West Edmond pool ordered by the Corporation Commission in the interest of conservation. The brightest spot in the production picture of the state is in the southwestern district where the daily average was increased 9,904 barrels from a daily average of 60,020 for 1945 to 69,924 barrels for 1946.

RESERVES

The Committee on Reserves of the American Petroleum Institute reports total proved reserves for Oklahoma as 898,186,000 barrels as of December 31, 1946, and total proved reserves in 1945 of 889,839,000 barrels. This is an increase of 8,347,000 or 0.938 per cent. Reserves added during 1946 are reported as 146,154,000 barrels. This is an increase of 88,357,001 barrels over 1945 (57,796,999 barrels), or a percentage increase of 153 per cent. A further break-down shows that the reported 47,731,000 barrels for reserves in new pools was second highest

[1] Presented by title before the Association at Los Angeles, March 24–27, 1947. Manuscript received, March 26, 1947.

[2] Sun Oil Company. The assistance of others, with special reference to Floyd L. Swabb, is acknowledged and appreciated.

[3] Production and reserve figures are from report by American Petroleum Institute.

TABLE I

DAILY AVERAGE PRODUCTION BY DISTRICT*

	1946 (Barrels)	*1945 (Barrels)*	
Seminole area	58,637	59,004	
Southwestern	69,924	60,020	
Northern	22,761	21,944	
Osage	25,868	28,287	
Northeastern	10,767	10,663	
Central	19,243	19,287	
Oklahoma City area	105,716	117,237	includes West Edmond
Creek County	23,848	24,465	
East Central	7,189	7,121	
Southeastern	30,972	34,228	
State Total	374,925	382,256	

* Production figures by courtesy of Vance E. Rowe.

among the states and an increase of 25,556,000 barrels over 1945 (22,175,000 barrels), or a percentage gain of 115.6 per cent. Reserves added due to extensions and revisions were 98,423,000 barrels, also an increase of 62,802,000 barrels over 1945 (35,621,000 barrels), a percentage increase of 176 per cent.

WELL DEVELOPMENT

The number of well completions of all types was 3,119, an increase of 859 wells, 38 per cent over the 1945 report of 2,260 wells (corrected).

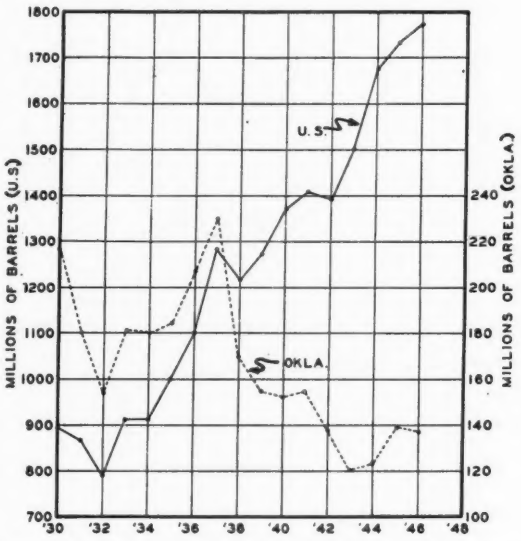
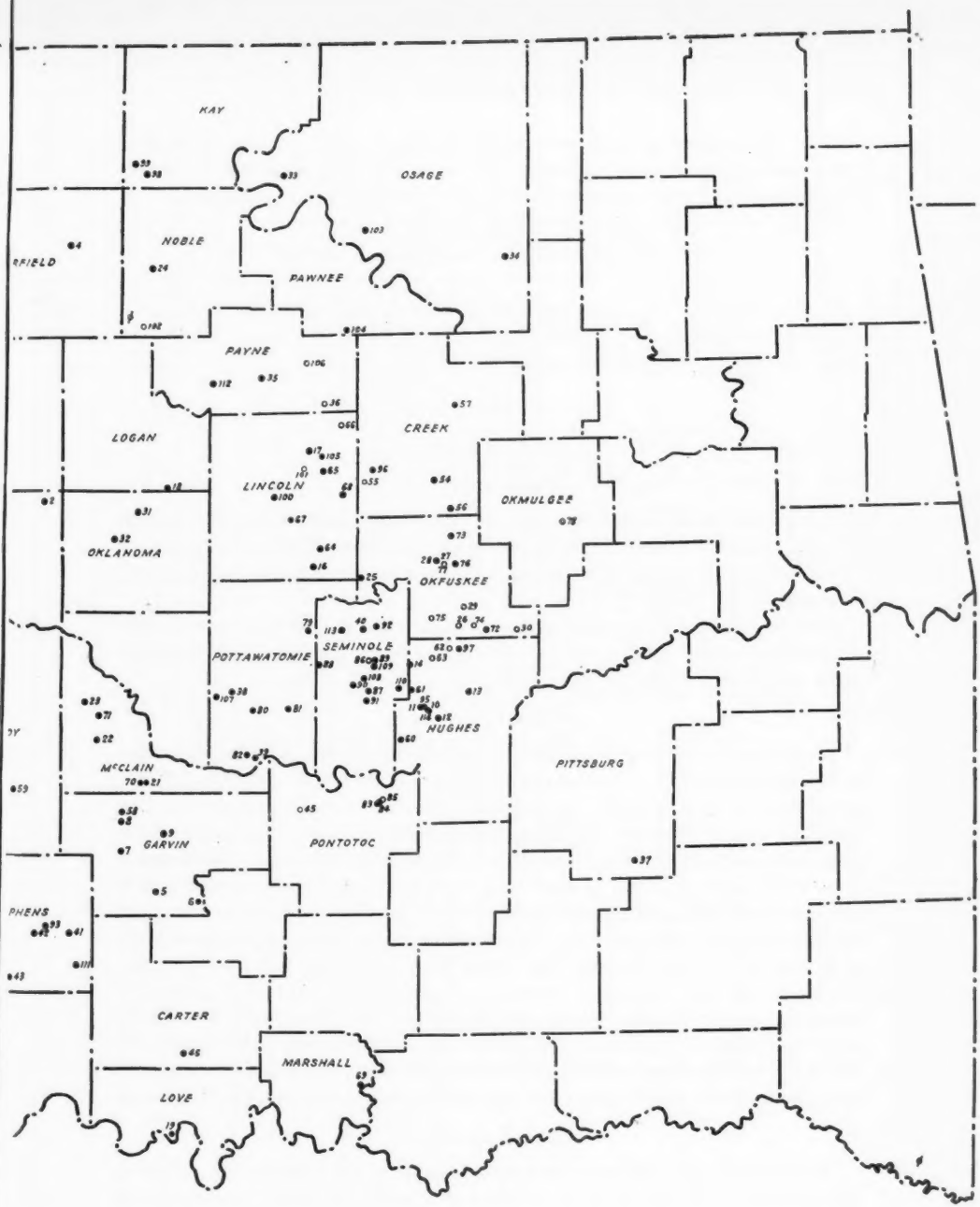


FIG. 1.—Graph showing relation of Oklahoma production to national production, 1930–1946.

FIG. 2.—Map showing new oil and gas pools, a



RTANT WILDCATS DRY HOLES.

pools, and important dry holes drilled in 1946.

In all, 588 exploratory wells were drilled. Of this number, 114 were successful, 71 discovered new oil pools, 22 were completed as new gas pools, 18 were classed as extensions and 3 were completed in new producing formations in old pools.

TABLE II

COMPARATIVE BREAK-DOWN OF WELLS DRILLED 1941–1946

	Total	*Oil*	*Gas*	*Dry*	*Extension*	*New Formation*	*Total*	*All Others*
1946	3,119*	71	22	474	18	3	588	2,531
1945	2,351*	51	22	301	32	12	418	1,933
1944	1,890	36	8	244	30	27	345	1,545
1943	1,187	34	10	254	23	15	336	851
1942	1,191	32	7	178	21	15	253	938
1941	2,162	39	2	190	13	27	271	1,891

* Total number of wells drilled in 1945 and 1946 taken from *Oil Weekly*.

DISCOVERIES

The number of discoveries in 1946 was 114, nearly equal to the 118 reported for 1945 as shown in Table II. The list of oil pools increased from 51 in 1945 to 71 in 1946 or 39.2 per cent, while the number of gas pools remains the same (22) at the end of the year.

None of the discoveries could be classed as of major importance; however one had possibilities and another was interesting due to the many wildcats drilled in search of similar pools with some success.

SOUTHWEST ANTIOCH

Southwest Antioch was discovered by the Globe Oil and Refining Company and Vickers Petroleum Corporation's Gibson No. 1 in the center of the SE. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 30, T. 3 N., R. 2 W. It was spudded on October 10, 1945, and completed on March 11, 1946. The reason for drilling was a combination of regional subsurface, geophysics, and surface data. The well was drilled to 7,760 feet, into the Bromide sands which were dry, and plugged back to a Pennsylvanian sand where drill-stem tests had indicated possible production. Seven-inch pipe was run to 7,578 feet and cemented with 300 sacks. After testing the Bromide sands a Lane-Wells plugs was set at 6,590 feet and the casing perforated from 6,533 to 6,539 feet where the well was completed, flowing 20 barrels per hour of 40.8° gravity oil through a 28/64-inch tubing choke. The producing sand, since named the Gibson sand, is a member of the Deese formation of the Ardmore section. Regionally the well is in what has been termed the Elmore embayment which is a synclinal area between the Pauls Valley uplift and the south lobe of the Arbuckle Mountains.

ESSAQUANAHDALE POOL

The Bridwell Oil and Gas Company's Houghton No. 1, in the SE. $\frac{1}{4}$, NW. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 23, T. 3 S., R. 11 W., touched off a shallow drilling campaign that resulted in the discovery of several other shallow pools and the completion of 114 dry exploratory wells in 1946. The Houghton No. 1 was drilled following seismo-

TABLE III

New-Field, New-Pool, Outpost, Deeper-Pool, and Shallower-Pool Discoveries

Index No.	Operator	Farm	Location	County	Completion Date	Reason For Drilling	Total Depth	Plug Back Total Depth	Producing Formation	Field Name	Initial Production
					NEW-FIELD WILDCATS*						
1	Stephens Pet.	Pennington 1	27-8N-25W	Beckham	8-6	Unknown	2,402	1,979	Perm. Dolo.	NW. Self	936 M Gas
2	Fox and Fox	Simpson 1	9-14N-5W	Canadian	1-29	Non-technical	8,366	7,082	Penn.		150 Bbls. each 30 days
3	Bridwell Oil	Houghton 1	23-3S-11W	Cotton	5-1	Seismic	1,500	1,500	Penn.	Essaquanahdale	27 Bbls.
4	Porter-Barnett	Seigle 1	32-23N-4W	Garfield	7-30	Seis-subsurf.	6,125	6,120	"Wilcox"	Sespring Valley	50 Bbls.
5	Carter Oil Co.	Burford 1	5-1N-1W	Garvin	10-29	Seismic	7,905	6,094	Penn.	Katie	463/64" choke
6	Continental Oil	Butterfly 1	14-1N-1E	Garvin	4-26	Seismic	4,423	4,067	Ord.	NE. Butterfly	245 Bbls.
7	Vickers-Globe	Gibson 1	30-3N-2W	Garvin	3-2	Seismic	7,760	6,564	Penn.	SW. Antioch	20/Hr/20/64" T.C.
8	R. H. Dearing	McBride 1	30-4N-2W	Garvin	4-16	Seismic	6,666	6,590	Penn.	SW. Mayesville	107 Bbls.
9	Sohio Pet. Co.	Tolbert 1	9-3N-1W	Garvin	3-26	Seismic	4,589	4,557	Bromide	Whitebead	5/8 MM 1/2" T.C.
10	B. C. Deardorf	Miller 1	5-7N-9E	Hughes	10-29	Subsurface	2,882	2,882	Booch	E. Holdenville	60 Bbls.
11	W. N. Bartlett	Harjo 1	6-7N-9E	Hughes	2-12	Sub-seismic	3,698	2,852	Booch	Holdenville	20 Bbls.
12	B. C. Deardorf	Gentry 1	14-7N-9E	Hughes	8-27	Sub-seismic	3,005	2,894	Booch	Grief Creek	81/44/64" T.C.
13	A. H. Grimes	Meadows 1	23-8N-10E	Hughes	4-2	Seismic	3,435	3,435	Cromwell	Greasy Creek	250 Bbls.
14	Mid-Continent	Rogers 1	26-9N-8E	Hughes	6-14	Seismic	4,456	3,269	Gilcrease	NW. Adams	26 Bbls.
15	Texas Co.	Hickman 1	5-1N-19W	Jackson	4-16	Subsurface	3,042	1,551	Permian Granite Wash	NE. Altus	16 Bbls.
16	Danciger O-R	Patulik 1	15-12N-5E	Lincoln	8-6	Seismic	4,544	4,483	Hunton	Robinson Creek	252/14 Hrs/20/64" T.C.
17	Olson Drilling Co.	Wilson 1	20-16N-5E	Lincoln	1-18	Seismic	3,546	3,540	Prue	E. Parkland	230 Bbls.
18	Sinc-Prairie	Teuscher 1	34-15N-1W	Logan	2-17	Seismic	5,941	5,941	"Wilcox"	Coon Creek	549 Bbls.
19	California Co.	Wright 1	13-8S-1W	Love	6-25	Seismic	7,383	6,270	Penn.	Sivells Bend	50 Bbls.
20	Sup. of Calif.	Manning 1	27-22N-10W	Love	6-25	Seismic	8,275	6,746	Prue	Ringwood	156 Bbls.
21	Big Chief Dr.	Stephens 1	24-5N-2W	McClain	8-20	Seismic	7,977	6,558	Penn.	SW. Wayne	236 Bbls.
22	Carter Oil Co.	Mottinger 1	5-6N-3W	McClain	1-15	Seismic	11,237	10,922	"Wilcox"	Iron Chapel	687 Bbls.
23	Carter Oil Co.	Thompson 1	36-8N-4W	McClain	5-29	Seismic	10,592	10,035	Hunton	Blue Hill	420 Bbls.
24	Eason Oil Co.	Carter-Boyce	19-22N-1W	Noble	10-8	Seismic	5,183	4,815	Miss. Ls.	Fourdee	153 Bbls.
25	Mid-Continent	Baker 1	31-12N-7E	Okfuskee	11-13	Seismic	4,361	2,950	Prue	Garden Grove	20 Bbls.
26	Amerada	Canard 1	16-10N-10E	Okfuskee	9-7-45	Seismic	4,878	3,381	Cromwell	NE. Scott	3 MM
27	Wilcox O-G	Lewis 1	24-12N-9E	Okfuskee	5-27	Seismic	3,926	3,203	Cromwell	W. Morse	2.8 MM
28	Loftus Dr. Co.	Kenneda 1	14-12N-9E	Okfuskee	7-3	Subsurface	3,705	3,705	Hunton	Buckeye	7 Bbls.
29	Ralph Fillmore	Palmer 1	34-11N-10E	Okfuskee	11-12	Subsurface	3,123	3,092	Gilcrease	Bigham	1.6 MM
30	Public Service	Rose 1	20-10N-12E	Okfuskee	2-12	Seismic	2,382	2,382	Gilcrease	Dustin	3 MM
31	Gulf Oil Corp.	Moyer 1	15-14N-2W	Oklahoma	5-23	Seismic	6,169	5,834	Hunton	Coffee Cr.	164 Bbls.
32	Ace Gutowsky	Crum 1	24-13N-3W	Oklahoma	5-10	Non-technical	6,949	5,731	Cleveland	Lone Star	12 Bbls.
33	A. G. Oliphant	Cox 1	21-25N-4E	Osage	8-24	Subsurface	3,571	2,880	Cleveland	Drum Creek	30 Bbls.
34	Virgil Greenwood	Osage 1	13-22N-11E	Osage	12-31-45	Subsurface	1,634	1,626	Tucker	G. I. Joe	90 Bbls.
35	Fleet-Roodhouse	Ball 1	10-18N-3E	Payne	10-29	Seismic	3,954	3,954	Burbank	NW. Mehan	70 Bbls.
36	Mul-Berry	Neuman 1	2-17N-5E	Payne	10-7	Seismic	3,972	3,100	Prue	Harmony	1.9 MM
37	J. C. Craig	Wilkins 1	8-2N-16E	Pittsburgh	9-17	Unknown	289	289	Penn.		4 Bbls.
38	Continental	Klinglesmith 1	23-8N-2E	Pottawatomie	6-18	Seismic	5,639	5,639	"Wilcox"	N. Tribby	113 Bbls.
39	Berry *et al.*	Johnson 1	27-6N-3E	Pottawatomie	7-15	Subsurface	1,855	1,855	Hoover	W. Asher District	34 Bbls.
40	Gulf Oil	Remaklus 1	17-10N-7E	Seminole	7-28	Subsurface	3,846	3,749	Gilcrease	Gar Creek	147/5 Hrs.
41	Skelly Oil Co.	Williams 1	16-1S-4W	Stephens	5-7	Seismic	7,158	5,448	Dornick Hills	North Alma	115 Bbls.
42	Amerada Pet.	Sledge 1	19-1S-5W	Stephens	11-26-45	Core drilling	3,623	2,240	Hoxbar	W. Velma	12 Bbls.

TABLE III—(*continued*)

Index No.	Operator	Farm	Location	County	Completion Date	Reason for Drilling	Total Depth	Plug Back Total Depth	Producing Formation	Field Name	Initial Production
					NEW-FIELD WILDCATS—(*continued*)						
43	W. H. Atkinson	Peck 1	32-2S-6W	Stephens	3-5	Unknown	2,483	2,483	Penn.	W. Loco	75 Bbls.
44	Atlantic	Hill 1	25-8N-18W	Washita	3-13	Seismic	6,500	6,235	Springer	Rocky	27 MM
45	Texas Co.	Gray 1	18-4N-5E	Pontotoc	8-6	Seismic	3,249	404	Penn.	Center	650 M
					NEW-POOL WILDCATS**						
46	W. F. Turner	George 1	17-5S-1E	Carter	6-25	Subsurface	2,686	2,560	Penn.	Brock	60 Bbls.
47	Stanolind	Schonwald	21-3N-8 ECM	Cimarron	2-9	Seismic	5,117	4,917	Penn.	South Keyes	1½ MM
48	Pure Oil	Sparkin 1	3-5N-8ECM	Cimarron	5-14	Seismic	5,015	4,747	Miss.	Keys	170 M
49	Pure Oil	Johnson 1	12-5N-7ECM	Cimarron	1-22	Seismic	5,010	4,885	Penn.	Keys	552 Bbls.
50	Johnson-Acme	Simon 1	9-3S-11W	Cotton	10-15	Trend	1,615	1,615	Penn.	Soldier Cr.	40 Bbls.
51	L. C. Choate	Shelby 1	5-4S-10W	Cotton	10-15	Trend	1,356	1,356	Penn.	E. Cache Cr.	60 Bbls.
52	R. B. Ferris	Wook-Kah-Nah	1-4S-11W	Cotton	6-25	Trend	1,328	1,328	Penn.	Cache Creek	125 Bbls.
53	Martin Prop.	Dyer	33-2S-11W	Cotton	11-20	Trend	1,556	1,556	Penn.	N. Soldier Cr.	200 Bbls.
54	Vierson Dr. Co.	Anthes	27-15N-9E	Creek	12-18-45	Subsurface	2,660	2,350	Prue		8 Bbls.
55	Davon Oil Co.	McVey	29-15N-7E	Creek	11-30-45	Sub-Seismic	2,887	2,878	Prue	SW. Milfay	1.2 MM
56	W. M. Dunn	Walker 1	30-14N-10E	Creek	4-30	Seismic	2,954	2,954	Dutcher	Tuskegee	25 Bbls.
57	Skelly	Holbert 1	8-17N-10E	Creek	2-5	Seismic	2,989	2,989	"Wilcox"	NW. Kellysville	42 Bbls.
58	Carter Oil Co.	Eskridge 1	19-4N-2W	Garvin	10-72	Seismic	7,700	7,410	Bromide	SW. Mayesville	198/10 Hrs.
59	Magnolia Pet.	Spiers 1	28-5N-6W	Grady	8-27	Seismic	11,865	11,740	Penn.	Chitwood	500/16 Hrs./10/64" T.C.
60	Bartlett-Heathman	McCowen 1	10-6N-8E	Hughes	1-8	Trend	2,748	2,748	Booch	Spaulding	43 Bbls.
61	Apperson-Sherrod	Barnard 1	23-8N-8E	Hughes	11-19	Subsurface	3,296	3,296	Cromwell	N. Jefferson	60 Bbls.
62	Leach-Warren	Brooks 1	7-9N-10E	Hughes	1-1	Sub-Seismic	3,490	2,691	Booch	NE. Papoose	5.4 MM
63	E. L. and B. Drlg.	Cox 1	19-9N-9E	Hughes	2-9	Subsurface	3,378	2,740	Booch	SW. Papoose	1 MM
64	Sam A. King	Earlabaugh 1	34-13N-5E	Lincoln	5-20	Seismic	4,303	4,303	Hunton	NW. Wilzetta	360 Bbls.
65	Texola	Strough 1	11-15N-5E	Lincoln	7-22	Sub-Seismic	4,174	3,680	Bart	E. Kendrick	30 Bbls.
66	Kemp-Jackson	Wagoner 1	33-17N-6E	Lincoln	5-28	Subsurface	3,046	3,046	Red Fork	Ravendale	5 MM
67	Olson Drlg. Co.	Masten 1	35-14N-4E	Lincoln	10-4	Seismic	3,012	3,012	Cleveland	E. Gessman	3.3 MM
68	Hobble-Webb	Smith 1	3-14N-6E	Lincoln	8-20	Subsurface	4,066	4,054	Hunton	Stroud	7 Bbls.
69	Magnolia Pet.	South 2	19-6S-7E	Marshall	4-9	Subsurface	667	667	Cretaceous	Alyesworth	35 Bbls.
70	Big Chief Dr.	Comm. White 1	24-5N-2W	McClain	11-5	Subsurface	6,680	6,630	Hunton	SW. Wayne	416 Bbls./4" T.C.
71	Carter Oil Co.	Vierson 1	8-7N-3W	McClain	2-12	Seismic	10,668	10,075	Hunton	Washington	447 Bbls.
72	T. N. Berry	Catlett 1	29-10N-11E	Okfuskee	9-10	Subsurface	3,155	2,262	Booch	West Alabama	12½ Bbls.
73	Wilcox O & G	Hamby 1	18-13N-10E	Okfuskee	4-23	Seismic	2,965	2,827	Dutcher		11 Bbls.+
74	Amerada	Barry 1	23-10N-10E	Okfuskee	4-6	Seismic	3,993	3,163	Cromwell	NW. Hickory Ridge	14.6 MM
75	Sunray Oil Co.	Sam 1	10-10N-9E	Okfuskee	12-10	Seismic	3,312	3,069	Gilcrease	NE. Bearden	6½ MM
76	Doak-Hughes	Frank 1	20-12N-10E	Okfuskee	1-5	Subsurface	3,100	3,100	Cromwell	Morse	7 Bbls.
77	Wilcox O and G	Callahan 1	24-12N-9E	Okfuskee	7-5	Sub-Seismic	3,678	3,678	Hunton	W. Morse	3 MM
78	Monarch Royal.	Woodman 2	1-13N-13E	Okmulgee	12-30	Subsurface	1,801	1,801	Glenn		4 MM
79	J. S. Wise	State 1	16-10N-5E	Pottawatomie	11-5	Sub-Seismic	4,754	3,817	Earlsboro	Victory Hill	32 Bbls.
80	J. F. Smith	Kerker 1	3-7N-3E	Pottawatomie	1-5	Subsurface	4,925	4,563	Hunton	SE. Macomb Dist.	50 Bbls.
81	Mealy-Wolfe	Wise 1	2-7N-4E	Pottawatomie	8-10	Subsurface	4,265	4,265	"Wilcox"	St. Louis	360 Bbls.
82	Tidewater-Skelly	Royster 1	21-6N-3E	Pottawatomie	11-19	Seismic	4,241	4,241	Ordov. Dol.	W. Asher Dist.	100 Bbls.
83	Sunray Oil Co.	Busby 1	1-4N-7E	Pontotoc	12-11-45	Subsurface	4,501	3,815	Misener	N. Steedman	120 Bbls.
84	W. A. Delaney	Sarkey 1	1-4N-7E	Pontotoc	2-5	Subsurface	2,163	2,162	Gilcrease	Steedman Dist.	50 Bbls.

					NEW-POOL WILDCATS—(*continued*)						
85	Sunray Oil Co.	Phillips 1	1-4N-7E	Pontotoc	3-26	Subsurface	3,920	1,052	Allen	Steedman Dist.	1½ MM
86	Portable Drlg.	Campbell	21-9N-7E	Seminole	7-15	Seismic	3,438	1,936	Penn.	Twin Lakes	4 MM
87	Manahan Oil Co.	Harris 1	21-8N-7E	Seminole	10-22	Trend	3,303	3,303	Gilcrease	Wewoka Lake District	95 Bbl./¼" T.C.
88	Winona O and G	Goesee 1	27-9N-5E	Seminole	8-13	Subsurface	4,332	3,493	Earlsboro	Earlsboro Dist.	82 Bbls.
89	Globe Oil	Davis-Patton 1	22-9N-7E	Seminole	2-13	Sub-Seismic	3,452	3,430	Cromwell	Twin Lakes	144 Bbls./22 MM Gas
90	Jack White	White 1	12-8N-6E	Seminole	8-17	Unknown	3,303	3,297	Gilcrease		25 Bbls.
91	Smith-Horton	Letka 1	32-8N-7E	Seminole	11-13	Subsurface	3,294	3,294	Cromwell		105 Bbls./¼" T.C.
92	Standard of Kansas	Roberts 1	15-10N-7E	Seminole	12-30	Subsurface	3,572	3,572	Gilcrease	SW. Sylvan	405 Bbls./5/16" T.C.
93	W. F. Turner	Riveire 2	10-1S-5W	Stephens	12-11-45	Subsurface	2,360	2,204	Penn.	North Alma	40 Bbls.
					OUTPOSTS***						
94	Blalock	Barner 1	10-3S-11W	Cotton	12-17	Non-technical	1,635	1,635	Penn.	Soldier Cr.	47 Bbls.
95	Horner-Kistler	Williams 1	6-7N-9E	Creek	8-17	Subsurface	2,820	2,820	Booch	NW. Holdenville	4 Bbls./2 MM Gas
96	Deep Rcok	Kock 1	15-15N-7E	Creek	12-30	Subsurface	3,968	3,968	"Wilcox"	Milfay	90 Bbls.
97	Manahan Oil Co.	Darls 1	8-9N-10E	Hughes	6-7	Subsurface	3,522	3,458	Cromwell	Wetumka	14 Bbls.
98	Continental Oil Co.	Olson	24-25N-2W	Kay	2-9	Sub-Seismic	4,381	4,371	Miss.	Tonkawa	104 Bbls.
99	Continental Oil Co.	Miller 1	9-25N-2W	Kay	9-10	Subsurface	4,455	4,250	Miss. Ls.	Thomas	24 Bbls.
100	Fred Morgan	Cash 1	6-14N-4E	Lincoln	7-5	Subsurface	4,305	4,226	Skinner	Chandler	120 Bbls.
101	Wofford-Nicholson	Mayly 1	7-15N-5E	Lincoln	8-17	Subsurface	3,572	3,562	Prue	Kendrick	19 MM
102	Dillmore *et al.*	Balzinger 1	23-20N-2W	Noble	6-21	Subsurface	5,180	3,962	Layton	Lucien	25 Bbls.
103	Texas Co.	Osage 1	17-23N-7E	Osage	6-15	Subsurface	3,206	3,034	Hominy	South Naval Reserve	25 Bbls.
104	Devonian Oil Co.	Thornton 1	34-20N-6E	Payne	7-27	Subsurface	2,933	3,935	Burbank	Maramec	8 Bbls.
105	Home Gas Co.	State 1	36-18N-4E	Payne	1-15	Seismic	3,705	3,705	Bartlesville	Georgia	4.6 MM
106	Skelly Oil Co.	Simpson 2	30-19N-5E	Payne	11-13	Seismic	3,829	3,365	Red Fork	Ingalls Dist.	1.6 MM
107	J. S. Wise	Spencer 1	30-8N-2E	Pottawatomie	10-19	Subsurface	6,201	6,201	"Wilcox"	West Burnett	215 Bbls.
108	I. R. McQueen	Burns 1	5-8N-7E	Seminole	3-23	Subsurface	3,375	3,312	Booch	Sancho	20 Bbls.
109	Bauman Drlg.	Coster 1	21-9N-7E	Seminole	5-31	Subsurface	3,439	3,439	Cromwell	Twin Lakes	152 Bbls.
110	J. A. Ligon	Buck 1	16-8N-8E	Seminole	9-7	Subsurface	3,252	3,252	Gilcrease	NE. Wekoka	180 Bbls.
111	Skelly *et al.*	Chilton Mayo Unit 1	14-2S-4W	Stephens	1-21	Sub-Seismic	7,177	2,940	Penn.	Milroy	28 Bbls.
					DEEPER-POOL TESTS****						
112	Mid-Continent	Ramsey 4	18-18N-2E	Payne	5-18	Subsurface	4,751	4,802	2d "Wilcox"	Ramsey	854 Bbls.
113	Carter Oil Co.	Kiker 1	14-10N-6E	Seminole	6-29	Subsurface	4,190	4,445	Viola	Keokuk	28 Bbls.
					SHALLOWER-POOL TESTS						
114	B. C. Deardorf	Miller A 1	5-7N-7E	Hughes	11-26	Subsurface	906	906	Calvin	E. Holdenville	125 Bbls.

* A new-field wildcat is a hole drilled on a geologic structure, or in a geologic environment, where petroleum has not yet been discovered.

** A new-pool wildcat is a hole drilled on a structure, or in a geologic environment, where other pools have been found, but where the complexities in the underground geologic conditions are so great that searching for a new pool is very hazardous.

*** An outpost is a hole drilled with the thought that it will extend by considerable distance, a pool already partly developed.

**** A deeper-pool test is a well located within the known limits of a pool and drilled with the object of searching for new producible formations below the producing formation of the pool.

M—Thousand.
MM—Million.

graph exploration. It was spudded on April 5, 1946, and completed on May 28, 1946, pumping 27 barrels of 35.7° gravity oil per day. The sand was found at 1,490 feet and a core taken from 1,490 to 1,498 feet recovered 8 feet of saturated sand. Seven-inch pipe was run to 1,490 and cemented with 80 sacks of cement. The producing formation is a sand lens of the Pontotoc formation of Pennsylvanian age which overlies a regionally high area of the Arbuckle limestone.

IMPORTANT DRY HOLES

Of the many important dry exploratory holes drilled, the Oklahoma Natural Gas *et al.*, Oakwood unit No. 1, NW. ¼, NW. ¼, NW. ¼ of Sec. 6, T. 17 N., R. 14 W., Dewey County, was the most interesting in the western part of the state. It was drilled to 12,610 feet and tested the "Wilcox" sand. Seven-inch pipe was run to 9,420 feet and a Pennsylvanian sand was tested which yielded a showing of oil and gas being abandoned. A well drilled by the Snowden Oil and Gas Company, in McCurtain County, on the Morgan farm in the SE. ¼, SE. ¼, SE. ¼ of Sec. 25, T. 9 S., R. 25 E., was reported to be in granite when the well was completed at 2,874 feet. An important deeper-pool test was the Shell Oil *et al.*, Magney No. 1, in the center of the SW. ¼, SW. ¼ of Sec. 17, T. 20 N., R. 2 W. This is in the Lucien pool and was deepened to test the Reagan sand on a well defined anticline. Dry Reagan sand was found at 6,950 feet and the well stopped in granite with a total depth of 7,088 feet after drilling 39 feet in granite.

EXPLORATORY METHODS

Geophysical work was continued through the year 1946 and Table IV gives a summary.

TABLE IV

SUMMARY OF EXPLORATORY WORK 1942–1946

Type	*1946*	*1945*	*1944*	*1943*	*1942*
		CREW MONTHS OF WORK			
Seismograph	436	622½	459½	294½	358
Gravimeter	96	106½	72	66½	83
Torsion balance		5½			
Magnometer	3	23			14
Electrical resistivity					
Radioactivity		2			
Soil analysis					
Surface detail		12½	27½	9½	4½
		NUMBER OF HOLES			
Core drill	113	270	211	93	105
Stratigraphic drill		9	9	16	44

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DEVELOPMENTS IN TEXAS PANHANDLE IN 1946[1]

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ABSTRACT

The counties included in this report are the 25 countries in the Texas Panhandle north of the line connecting the southwest corner of Parmer County with the southeast corner of Hall County, Childress County excluded.

There was a marked decrease in drilling operations in the Texas Panhandle in 1946 compared with 1945. In all, 317 new wells were drilled: 149 were completed as oil wells, 123 as gas wells, and 45 as dry holes.

Slightly less than 30,000,000 barrels of oil were produced in 1946, which is more than 1 million barrels less than was produced in 1945. More than 881 billion cubic feet of gas were produced in 1946, which is 85 million cubic feet less than was produced the previous year.

Only one of the 14 exploratory holes drilled in the Panhandle in 1946 was successful. The Texas Company's M. S. Bills No. 1 in Wheeler County, drilled as an extension to the East Shamrock pool, was completed as a 29-barrel pumper. The Stanolind Oil and Gas Company's O. V. Beck No. 1 in Hartley County was drilled to granite.

There has been an increase in geophysical exploration in the Anadarko basin, resulting in new lease blocks, additions to lease blocks already held, and the drilling of numerous core and stratigraphic tests.

Two exploratory holes were drilled in the Anadarko basin in 1946. The British American Oil Company's Buzzard No. 1 in Ochiltree County was dry and abandoned at 3,852 feet, and O. P. Flynn's Hoover-Patton No. 1, in Ochiltree County, was dry and abandoned at 6,198 feet.

INTRODUCTION

The Panhandle district is defined in this report includes all 25 counties north of the line connecting the southwest corner of Parmer County with the southeast corner of Hall County, with the exception of Childress County. It is bounded on the north and east by Oklahoma, and on the west by New Mexico. Ten of these counties produce oil or gas or both.

DEVELOPMENT

TABLE I

COMPARISON OF DRILLING ACTIVITY IN 1945 AND 1946

	Oil Wells	*Gas Wells*	*Expl. Wells*	*Ext.*	*Dry*	*Total*
1945	183	341	19	0	43	567
1946	149	123	14	2	45	317

Drilling operations have decreased sharply in the past year. This is especially true in the gas areas of Moore, Sherman, and Hansford counties.

Production in the district has decreased in proportion to drilling operations. Less than 30,000,000 barrels of oil were produced in the Panhandle in 1946, a loss of over one million barrels compared with 1945. More than 881 billion cubic feet of gas were produced in 1946, which is 85 million feet less than was produced the previous year.

No new fields were discovered in the Panhandle in 1946.

[1] Manuscript received, March 20, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Gulf Oil Corporation.

TABLE II

Important Explanatory Wells

County	Operator	Farm	Location			Date of Completion	Basis for Location	Results	Total Depth (Feet)	Form. at T.D.	Remarks
			Sec.	Blk.	Surv.						
Ochiltree	British-American	Buzzard 1	69	13	T&NO	10-16-46	Core Drlg.	DA	3,852	Wolfcamp	
Ochiltree	O. P. Flynn	Hoover-Patton 1	213	43	H&TC	10-16-46	Subsurface	DA	6,198	Penn.	
Hartley	Pure	Skalsky 1	T. B. Russell Survey			1-23-46	Core Drlg.	DA	4,034	Wolfcamp	
Hartley	Pure	Robinson 1	152	48	H&TC	4- 3-46	Core Drlg.	DA	3,918	Wolfcamp	
Hartley	Stanolind	O. V. Beck 1	164	15	CS	4-10-46	Seismic	DA	5,959	Pre-Cam. granite	
Potter	A. W. Warner	Bush 1	12	M-14	GM	1- 9-46	Subsurface & Seismic	DA	4,005	Wolfcamp	
Wheeler	Texas	Bills 1	46	13	H&GN	8-26-46	Subsurface	29 bbl-p	2,132	Wolfcamp	Drld. as extension
Collingsworth	J. B. Barbour	Aldrous 1	84	16	H&GN	3- 6-46	Subsurface	DA	2,085	Wolfcamp	
Collingsworth	Bridgeport	Hughes 1	78	11	H&GN	2-26-46	Seismic	DA	4,150	Penn.	
Collingsworth	Bridgeport	Hughes 2	36	11	H&GN	7-17-46	Seismic and Subs.	DA	4,046	Penn.	
Collingsworth	Humble	Scruggs 1	58	19	H&GN	3-27-46	Seismic	DA	5,988	Miss.	
Parmer	Oil Well Drlg.	Thorp 1	10	H	CSS	12-31-56	Unknown	DA	7,511	Upper-Penn.	
Swisher	L. A. Helms	Watson 1	125	M-10	BS&F	5-29-46	Subsurface	DA	3,620	Clearfork	

EXPLORATORY METHODS

Exploratory work in the Panhandle in 1946 was largely geophysical; however, there was an increase in shallow core and stratigraphic test drilling in the Anadarko basin toward the end of the year. There were 3 such rigs running at the close of 1946.

At the beginning of the year there were 3 seismograph parties, 9 gravimeter crews, and 4 magnetometer crews working in the district, while at the close of the year there were 7 seismograph parties, 2 gravimeter crews, and no magnetometer crew in operation.

Geophysical work was concentrated in the Anadarko basin; however, some work was done in the southern parts of Parmer, Castro, and Swisher counties, some in the western parts of Oldham and Deaf Smith counties, and limited work in Armstrong County.

TRENDS IN LEASING

In all, 422,059 acres were leased in the Panhandle in 1946. Most of these leases were taken in the Anadarko basin as new blocks or additions to blocks already held. It is felt that most large blocks in the basin have been acquired, but that a continuation of fill-ins can be expected.

Leasing on a major scale is also anticipated in Castro and Swisher counties as a result of successful exploratory wells recently completed in Hale County.

NEW PUBLICATIONS

Several new papers regarding work and possibilities in the Panhandle were published in 1946. E. G. Dahlgren's paper, "The Panhandle Field: the World's Largest Natural Gas Reserve," was published in the July, 1946, issue of *Gas*. "The Anadarko Basin—Will It Pay Off," by Charles N. Gould, was published in the *Oil Weekly* of July 8, 1946. "Anadarko Basin Prospects," by R. C. Tuttle, was published in the *Oil Weekly* of July 22, 1946. Porter A. Montgomery, Jr., and LeRoy Fugitt's development paper for 1945 was published in the June, 1946, A.A.P.G. *Bulletin*.

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DEVELOPMENTS IN WEST TEXAS AND SOUTHEASTERN NEW MEXICO IN 1946[1]

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Hobbs, New Mexico, and Midland, Texas

ABSTRACT

There were 2,219 wells completed in 1946 in the area of this report; 1,843 in West Texas and 376 in Southeastern New Mexico. In West Texas there were 335 exploratory holes (123 successful), and in Southeastern New Mexico 67 exploratory holes (15 successful).

Pipe-line runs in West Texas were 191.27 million barrels in 1946, an increase of 9 per cent over 1945. Pipe-line runs in Southeastern New Mexico were 36.34 million barrels in 1946, a decrease of 1.5 per cent from 1945.

There was a significant increase in every phase of geophysical activity.

Discoveries of exceptional interest included oil and gas production in Pennsylvanian limestone on the Eastern platform and in the Midland basin; Mississippian limestone oil, for the first time in West Texas, in the Midland basin; and Ellenburger oil on the Eastern platform.

Of prime importance in the Delaware basin was the discovery of oil in Lower Permian beds below 10,000 feet.

No important field was discovered in Southeastern New Mexico during 1946. The exploitation of the long dormant shallow Bowers sand reservoir of the Hobbs field, notable extensions to the Paddock and Drinkard Permian pools, and the steady growth of the pre-Permian (Ellenburger) Brunson pool with resultant overlapping of these last three pools, constitute the most outstanding developments of 1946.

INTRODUCTION

The West Texas-Southeastern New Mexico district of this report is essentially the same as that of the preceding year with the exception of an additional county in New Mexico. The Texas part comprises 51 counties including Motley, Dickens, Kent, Scurry, Mitchell, Coke, Concho, Menard, Kimble, Sutton, Crockett, and Terrell on the eastern margin and all counties westward, while that portion of the district in New Mexico embraces the 8 counties, Lea, Roosevelt, Curry, De Baca, Chaves, Eddy, Otero, and Lincoln.

In the compilation of data for the report only those wells officially completed during 1946 have been considered, and in the classification of exploratory wells the method employed by F. H. Lahee[4] has been followed.

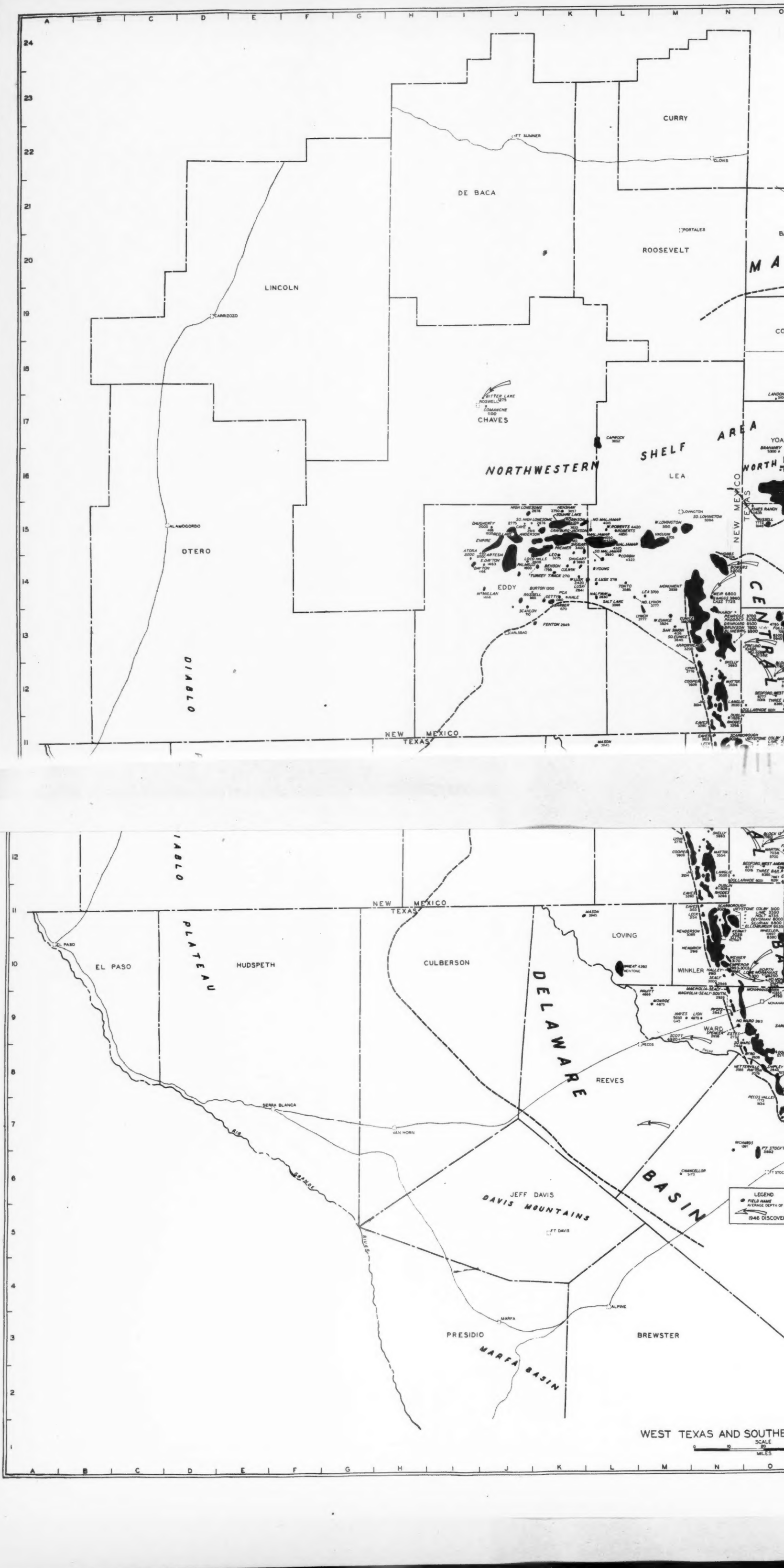
One deviation from the usual method of approach will be noted in the discussion of developments within the several platform and basin provinces common to both Texas and New Mexico. While many of the statistical data must necessarily

[1] Manuscript received, April 7, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] District geologist, Gulf Oil Corporation.

[3] Zone geologist, Gulf Oil Corporation. The writers wish to thank P. H. Reisher, chief geologist, Gypsy Division, Gulf Oil Corporation, and H. M. Bayer, chief geologist, Fort Worth district, Gulf Oil Corporation, for permission to publish this report. Glen Staley of the Lea County Operators' Committee furnished production data for New Mexico. W. M. Dressel assisted in the compilation of exploratory well tables. Helpful suggestions were obtained from numerous geologists in the Permian basin who prepared the annual development papers in previous years. Karl A. Mygdal offered valuable suggestions and criticism of the manuscript.

[4] Frederic H. Lahee, "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), pp. 629–45.


CURRY
DE BACA
ROOSEVELT
LINCOLN
CHAVES
NORTHWESTERN SHELF AREA
LEA
EDDY
OTERO
DIABLO PLATEAU
NEW MEXICO
TEXAS
LOVING
WINKLER
WARD
REEVES
DELAWARE BASIN
EL PASO
HUDSPETH
CULBERSON
JEFF DAVIS
DAVIS MOUNTAINS
PRESIDIO
BREWSTER
MARFA BASIN
FT SUMNER
CLOVIS
PORTALES
CARRIZOZO
ALAMOGORDO
ROSWELL
ARTESIA
CARLSBAD
HOBBS
LOVINGTON
JAL
CARRIZO
PECOS
VAN HORN
SIERRA BLANCA
FT DAVIS
MARFA
ALPINE
FT STOCKTON
EL PASO
RIO GRANDE
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AVERAGE DEPTH OF
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0 10 20
MILES

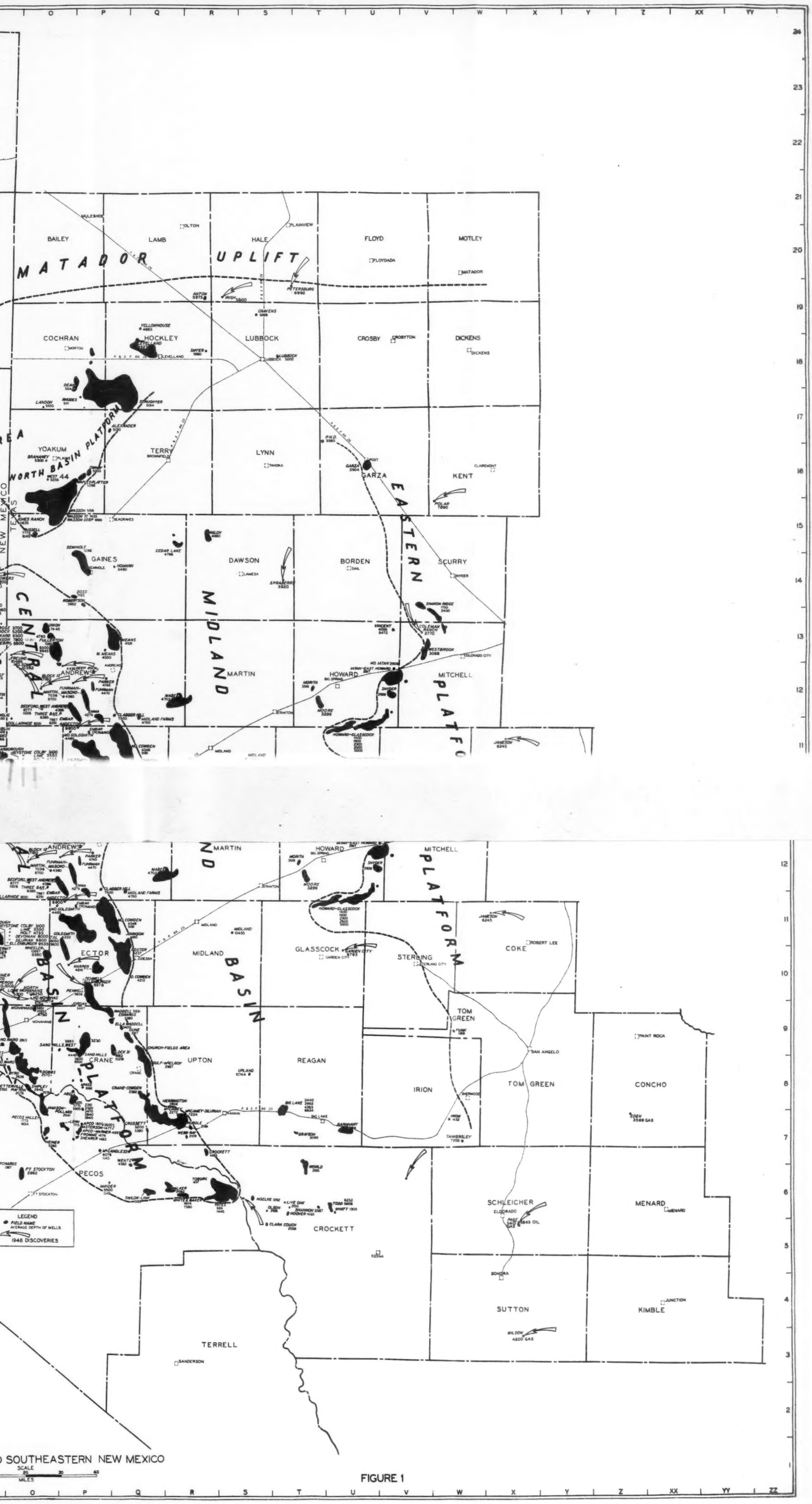
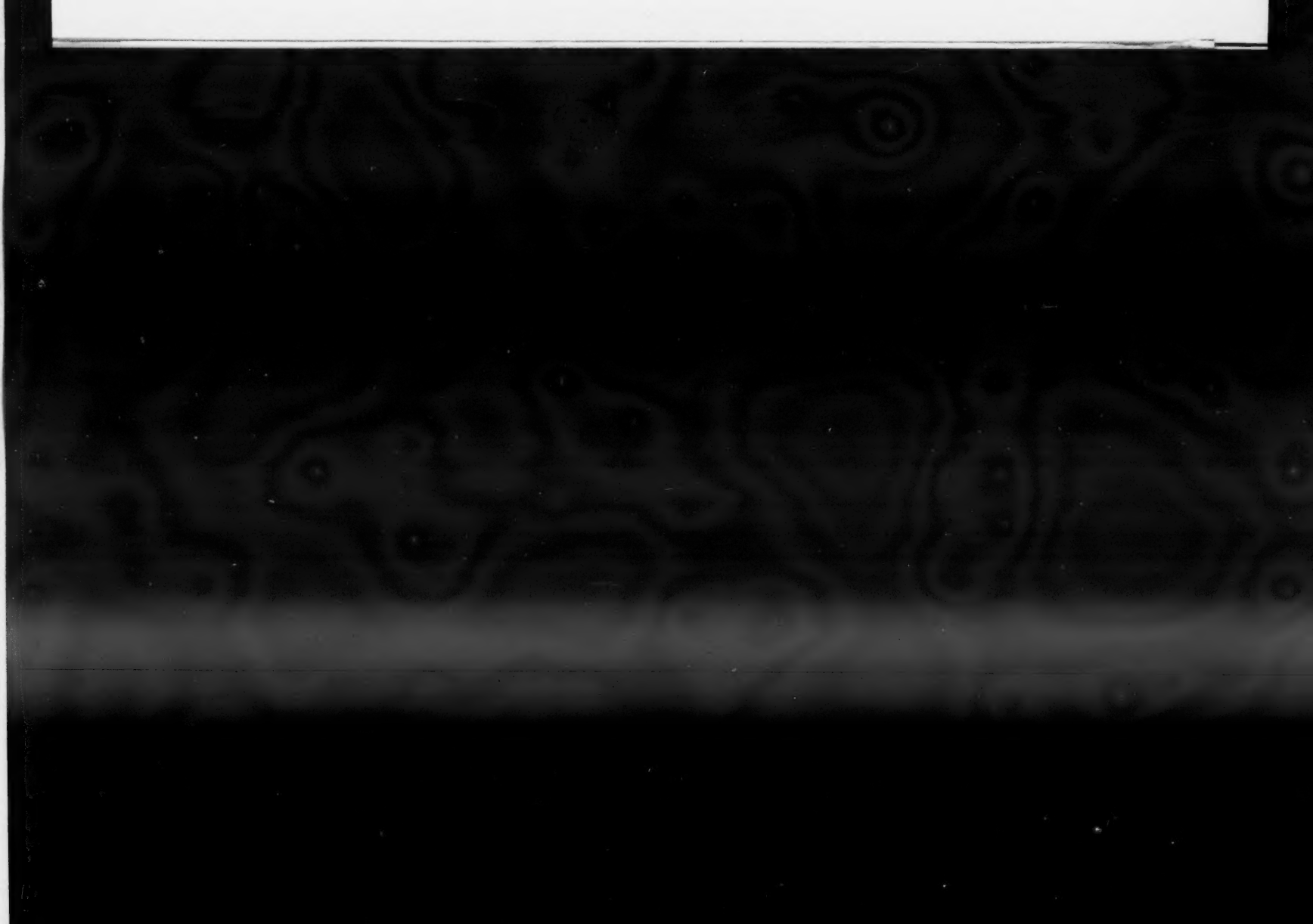

BAILEY
LAMB
HALE
FLOYD
MOTLEY
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
DICKENS
YOAKUM
TERRY
LYNN
GARZA
KENT
GAINES
DAWSON
BORDEN
SCURRY
ANDREWS
MARTIN
HOWARD
MITCHELL
ECTOR
MIDLAND
GLASSCOCK
STERLING
COKE
CRANE
UPTON
REAGAN
IRION
TOM GREEN
CONCHO
PECOS
CROCKETT
SCHLEICHER
MENARD
SUTTON
KIMBLE
TERRELL
MATADOR UPLIFT
NORTH BASIN PLATFORM
CENTRAL BASIN PLATFORM
MIDLAND BASIN
EASTERN PLATFORM
TEXAS
NEW MEXICO
SOUTHEASTERN NEW MEXICO
LEGEND
FIELD NAME
AVERAGE DEPTH OF WELLS
1946 DISCOVERIES
SCALE
MILES

FIGURE 1



be presented separately by states, these common geological provinces have been considered as individual units and no separation is made on the basis of superficial limits imposed by state boundaries.

The customary table of producing fields in West Texas and Southeastern New Mexico has been omitted from this year's report because of critical paper shortage.

GENERAL DEVELOPMENT

WEST TEXAS

New discoveries of outstanding geologic significance in 1946 included: Pennsylvanian (middle) limestone production in Coke County, and Lower Ordovician (Ellenburger) production in Kent County on the Eastern platform; Strawn gas production, Mississippian oil production, and oil and distillate production from Ellenburger beds in the Midland basin; Ellenburger oil in western Ector and western Andrews counties, lower Clear Fork oil in Ector County, and upper Clear Fork oil in southern Winkler County on the Central Basin platform; oil in Lower Permian beds in Reeves County in the Delaware basin; and Pennsylvanian oil in Hale County on the flank of the Matador uplift.

There were 1,843 wells completed in West Texas in 1946. This is an increase of 99 wells over the total number of wells completed in 1945 and exceeds by 251 wells the yearly average of the preceding 5 years.

Of the total number of wells drilled, 335 were classified as exploratory holes, an increase of 57 over the number drilled in 1945. Of these, 123 were successful, compared with 47 successful exploratory holes in 1945. The average number of successful exploratory holes for the preceding 5-year period is 33 per year.

It should be pointed out that part of the increase in exploratory drilling is accounted for by an unusual number of outposts drilled in the Block 31 field in Crane County and the Block 12 field in Andrews County to validate short-term leases. Ordinarily most of these wells would have been drilled in routine manner as structural conditions in the local areas were revealed. However, in following the Lahee definitions, they are exploratory wells.

Pipe-line runs for the year totalled 191,277,857 barrels, an increase of approximately 16 million barrels, or 9 per cent over pipe-line runs for the preceding year.

Despite record withdrawals from the West Texas-New Mexico area (approximately 227.5 million barrels) in 1946, proved reserves at the close of the year stood at an all-time high.

NEW MEXICO

The trend toward deeper drilling continued in New Mexico during 1946. Although there were no new fields of importance discovered during the year, significant extensions with a resultant development of multiple pays in the pre-San Andres formations of Lea County compensated for the decline in new fields discovered.

There were 376 wells completed in Southeastern New Mexico during 1946

of which 321 were producers of oil or gas. This is a decrease of 17 in total wells completed in 1945, but represents an increase of 22 over the average for the preceding 5-year period. There were 67 exploratory tests drilled which is also the figure credited to 1945 and is an increase of 20 above the average figure for the preceding 5 years. Of these, 15 were successful as compared with 9 for 1945 and 10 for the preceding 5-year average.

There were 63 producing wells completed in the Drinkard pool of Lea County during 1946 which gives it first rank in wells completed for any pool in Southeastern New Mexico during that period.

Pipe-line runs for the year totalled 36,340,000 barrels which is a decrease of 537,000 barrels, or 1.5 per cent less than 1945.

TABLE I

FIELDS WHICH HAVE PRODUCED ONE HUNDRED MILLION BARRELS

(December 31, 1946)

Field	*Location on Map*	*Accumulated Production (in Barrels)*
	WEST TEXAS	
Yates	R, S-6	314,520,248
Hendrick	N-10, 11	210,994,021
McElroy	Q-8	164,548,425
Howard-Glasscock	T, U-11	123,760,279
Wasson	O-15, 16	122,093,038
Big Lake	S-7, 8	106,631,557
	SOUTHEASTERN NEW MEXICO	
Eunice-Monument	M-13, 14	162,077,355
Hobbs	N-14	116,193,083

DEVELOPMENT BY GEOLOGICAL PROVINCES

LLANO UPLIFT

In Concho County, on the west flank of the Llano uplift, 5 wildcats were drilled through the Ellenburger dolomite and into the basal sandstone (loosely referred to as Hickory), in directions northwest, northeast, and south of the Eden gas field, *Z-7*,[5] searching for extensions to the Eden gas field, or new gas reservoirs in the vicinity. None of these tests was successful.

In Menard County, *Z-6*, the Warren Petroleum Company and T. F. Morrow completed their Russell No. 1, pumping 21 barrels of oil per day from a Canyon sandstone between 2,282 and 2,290 feet. This well is outside the confines of the Eastern platform of the Permian basin, on the flank of the Llano uplift.

EASTERN PLATFORM AREA

Permian developments.—The only successful new-field wildcat completed in a Permian formation on the Eastern platform was a discovery drilled by Norman and Roche as their S. R. Coleman No. 1, *V-13*. This well was completed in the Upper Clear Fork, at 2,770 feet. It had a 24-hour pumping potential of 67 barrels

[5] Refer to co-ordinates in Figure 1.

of oil. Successful outposts have been drilled north and south of this discovery, which is about 4 miles northwest of the north end of the Westbrook field, in Mitchell County.

Though it appears to be of small extent, the discovery of this new field, literally within sight of the oldest producing field in the Permian basin, in a different producing formation, is an example of the possibilities remaining in the Permian in the Eastern platform area.

Two miles west of the Westbrook field, *V-13*, Hickok and Reynolds completed Langley No. 1, pumping 56 barrels of oil and 8 barrels of water per day. The producing beds are Clear Fork dolomite at 3,151 feet.

Pre-Permian developments.—Of prime importance on the Eastern platform was the completion of the Sun Oil Company's Allen Jamison No. 1, in northwestern

TABLE II

GEOPHYSICAL ACTIVITY—NEW MEXICO

Method	*January*	*July*	*December*
Seismic	8	7	9
Gravity	8	6	10
Magnetic	5	9	6
Torsion balance	1	0	0
Totals	22	22	25

GEOPHYSICAL ACTIVITY—WEST TEXAS

Method	*January*	*July*	*December*
Seismic	26	37	41
Gravity	2	6	6
Magnetic	2	1	3
Torsion balance	0	0	0
Totals	30	44	50

Coke County, *X-11*, in a Pennsylvanian limestone, probably Canyon in age. This well was drilled to 6,245 feet. Its natural daily potential was 164 barrels of 46° gravity oil. A second well in this pool established a water level and showed that the oil-producing zone occurred throughout a 400-foot section of soft limestone. There appears to be no free gas associated with this reservoir.

This discovery should serve to intensify exploration for Pennsylvanian reef limestone production on the eastern side of the Permian basin, since it marks the seventh discovery of this type of production in a large area, covering parts of the Midland basin on the west.

The Jamison well was drilled on a structure originally mapped by surface geology and on which the Arkansas Fuel Oil Company had drilled a test to 4,670 feet in 1930.

Equally important from a geological viewpoint but as yet unproved as a major reserve was the discovery of Lower Ordovician (Ellenburger) oil in southwestern Kent County in the Humble Oil and Refining Company's Lida Vick No. 1, *V-15*. The Vick well was the discovery well in the Polar field, and was drilled to

7,938 feet, where it established a water level in the Ellenburger, and was plugged back to 7,890 feet. It was completed flowing 207 barrels of oil in 24 hours after one acid treatment.

Three dry holes were drilled within a radius of 3 miles, in directions north, west, and southwest of this discovery. One successful outpost was drilled on the northeast.

The discovery well was drilled on the basis of seismic work.

Important dry holes.—In extreme northwestern Garza County, *T-17*, the Honolulu Oil Company drilled a deeper-pool test in the PHD pool which produces from the San Andres dolomite. The well, B. Altman No. 1, was abandoned at the total depth of 9,603 feet. It encountered the pre-Cambrian basement at 9,595 feet, after penetrating 425 feet of Ellenburger.

The Humble Oil and Refining Company's Lulu C. Harris No. 1, *V-10*, in eastern Sterling County, was drilled on a seismic anomaly and was dry in the Ellenburger at 8,402 feet.

In Tom Green County, *X-9*, Bennett and Sorrels' F. S. Sanders No. 1 was drilled on a regional gravity and subsurface anomaly, as indicated by scattered control. This well was abandoned at 6,751 feet, after failing to develop production in the Ellenburger.

MIDLAND BASIN

Permian discoveries and developments.—The Seaboard Oil Company of Delaware completed its S. E. Lee No. 1, Dawson County, *S-14*, on January 24, 1946, the only successful new-field wildcat producing from Permian beds in the Midland basin. This well was completed in the San Andres dolomite, at 3,920 feet, producing 110 barrels of oil and 4 barrels of water per day.

Dry outposts have been drilled east, southwest, and west and there are 7 producing wells northeast of this discovery.

The Lee No. 1 well is 1 mile south of a 7,679-foot dry hole drilled by Seaboard in 1944 on a prominent seismic anomaly.

The north end of Cedar Lake structure, in northeastern Gaines County, was found to have another producing zone with the completion of B. H. Nolen's J. O. Jones No. 1, *Q*, *R-15*, which tested 7,500,000 cubic feet of gas per day from the Yates sand at 2,926 feet.

The only other area of notable activity in the Midland basin was the Welch field, *R-15*, in extreme northwestern Dawson County. This development is directly related to the laying of a pipe line into the pool in December, 1945. There had been virtually no development of this pool until a pipe-line connection had been made, although the initial well was completed in January, 1942.

Pre-Permian discoveries and wells in process of completion.—For the first time in the Permian basin, oil was produced commercially from limestone beds of Mississippian age, between 9,740 and 9,795 feet in the Shell Oil Company's L. C. Clark No. 1, in northeast Glasscock County, *U-10*. The well was drilled on the basis of seismic detail on a sharp regional structural anomaly. After drilling to 10,970

TABLE III

SUCCESSFUL EXPLORATORY WELLS—TEXAS, 1946

Map Co-ord.	County	Operator	Farm	Location	Total Depth (Feet) Drilled	Total Depth (Feet) Producing	Initial Production	Producing Formation	Pool—New or Extended
				New-Field Wildcats					
O-12	Andrews	Superior	Coopwood 1	Sec. 4, Blk. A-47	7,003	7,003	F. 691 BOPD+7% W.	Clear Fork	—
N-12		Shell	Nelson 1	Sec. 8, Blk. A-40	10,606	10,606	F. 515 BOPD	Ellenburger	Nelson
O-12		Texas	State "P" 1	Sec. 15, Blk. 12	8,404	7,318	F. 159 BOPD	Clear Fork	Block 12
O-12		Placid & Gulf	M. A. Thornberry 1	Sec. 5, Blk. A-42	11,960	11,957	33 BOPD+ 792 B Sul. W.	Ellenburger	Fuhrman-Mascho Ellenburger
N-13		Humble	H. O. Sims *et al.* 2	Sec. 25, Blk. A-39	10,535	10,535	F. 704 BOPD	Ellenburger	Freund
X-11	Coke	Sun	A. Jamison 1	Sec. 253, Blk. 1-A	6,245	6,254	F. 168 BOPD+45% W.	Strawn	Jamison
S-6	Crockett	Moore Expl.	Halff-Bivens 1	Sec. 65, Blk. 1	7,512	2,790	10½ BOPD	San Angelo	—
S-14	Dawson	Seaboard	Lee 1	Sec. 47, T&P RR Blk. 34	3,795	3,795	F. 167 BOPD+9 BW.	San Andres	Spraberry
O-11	Ector	Stanolind	J. M. Williamson 1	Sec. 5, T-1-N, Blk. 45	10,290	4,518	P. 28 BO+28 BW.	San Andres	—
O-1	Ector	Stanolind	Grisham-Hunter 1	Sec. 10, T-2-N, Blk. 45	7,965	7,965	F. 445 BOPD	Devonian	North Goldsmith Devonian
O-11		Humble	R. B. Cowden *et al.* B 1	Sec. 11, T-2-N, Blk. 45	8,600	8,596	F. 1176 BOPD	Ellenburger	Andector
O-10		Murchison	Fraser 1	Sec. 7, T-2-S, Blk. 45	8,566	8,566	P. 29 BO+33 BW.	Devonian	—
U-10	Glasscock	Shell	L. C. Clark 1	Sec. 5, T-4-S Blk. 32	10,970	9,795	F. 238 BO+15 BW.	Mississippian	—
Q-18	Hockley	Stanolind	Verrette 1	Lab. 7, Lge. 72	4,889	4,853	F. 343 BO+30 BW	San Andres	Levelland
V-15	Kent	Humble	Lida Vick 1	Sec. 45, Blk. 5	7,938	7,890	F. 207 BOPD	Ellenburger	Polar
	McCulloch	Guffey Drlg.	Stewart 1	Sec. 140, H&TC	972	972	1,350,000 CFGPD	—	—
Z-6	Menard	Warren Pet. & Morrow	Russel 1	Sec. 18, S. Wallick	2,309	2,309	P. 21 BOPD	Canyon	Morrow
V-13	Mitchell	Norman & Roache	Coleman 1	Sec. 70, Blk. 97	2,770	2,770	P. 67 BOPD	Clear Fork	Coleman Ranch
Q-7	Pecos	Bryd & Frost Inc.	Jackson 1	Sec. 46, Blk. 11	1,364	1,308	2,200,000 CFGPD	Yates	—
P-7		McCandless	Atlantic 1-115	Sec. 115, Blk. 11	2,260	2,260	4,500,000 CFGPD	San Andres	—
O-7		Penn	Shearer 1	Sec. 41, Blk. 10	1,964	1,964	F. 36 BOPD	Queen	—
R-6		Helmerich & Payne	White & Baker 8-C	Sec. 44, Blk. Z	9,811	7,985	F. 176 BOPD	Pennsylvanian	White & Baker Pennsylvanian
X-3	Sutton	Shell	D. Wilson 1	Sec. 38, Blk. 14	6,170	4,270	9,200,000 CFGPD	Strawn	—
M-8	Ward	Continental	F. H. Scott 1	Sec. 33, Blk. 33	4,920	4,910	P. 6 BOPD	Delaware	—
M-N-10	Winkler	Ralph Lowe	Sealy-Smith 1	Sec. 71, Blk. A	6,500	5,300	F. 300 BOPD	Holt	—
				New-Pool Wildcats					
O-12	Andrews	Mid-Continent	University (Lse 15) 2	Sec. 42, Blk. 13	8,850	7,210	312 BOPD+12% sul W.	Clear Fork	Fullerton
P-8	Crane	Humble	N. M. Tucker *et al.* 1	Sec. 23, Blk. 1	6,344	6,020	6,300,000 CFPD	Middle Ordovician	
								Waddell Sand	Abell
P-11	Ector	Texas	Fraser "D" 1	Sec. 27, T-1-S Blk. 45	10,975	10,900	F 1,700 BO	Ellenburger	TXL
P-10		Phillips *et al.*	Eidson-Scharbauer 1	Sec. 25, Blk. B-15	9,020	8,978	F. 10,065 BOPD	Ellenburger	—
P-11		Phillips	TXL "E" 1-A	Sec. 39, T-1-S, Blk. 45	11,506	5,825	F. 139 BOPD	Clear Fork	TXL
P-11		Texas	Fraser "F" 1	Sec. 39, T-1-N, Blk. 45	9,835	9,835	F. 1,451 BOPD	Ellenburger	TXL
Q-15	Gaines	B. H. Nolen *et al.*	Riley 1	Sec. 11, Blk. H	4,815	4,815	P. 126 BOPD	San Andres	Cedar Lake
Q-7, 8	Upton	Gulf	G. E. Farley 1	Sec. 12, Blk. 3½	2,568	2,365	P. 143 BOPD	Grayburg	McCamey
N-0, 8	Ward	Golston *et al.*	W. L. Moody Est. 1	Sec. 32, Blk. 34	2,725	2,550	F. 30 BOPD	Seven Rivers	Byrd (?)
O-9	Winkler	Stanolind	Sealy-Smith Fdn. "A" 8	Sec. 48, Blk. A	5,224	5,224	F. 421 BOPD	Clear Fork	—
N-11		Stanolind	Taylor 1	Sec. 8, Blk. B-2	10,280	8,730	F. 617 BOPD	Devonian	Keystone Devonian
O-15	Yoakum	Honolulu	Hovenkamp 9	Sec. 890, Blk. D	11,592	7,816	P. 133 BOPD	Clear Fork	Wasson Clear Fork

TABLE III—(*Continued*)

Map Co-ord.	County	Operator	Farm	Location	Total Depth (Feet) Drilled	Producing	Initial Production	Producing Formation	Pool—New or Extended
				Deeper-Pool Tests					
O-12	Andrews	Mid-Continent	University 3-11	Sec. 29, Blk. 13	10,696	10,640	F. 1094 BOPD	Ellenburger	Fullerton Ellenburger
O-12		Humble	Parker 2	Sec. 23, Blk. A-41	8,880	8,880	F. 1594 BOPD	Ellenburger	Martin Ellenburger
O-11	Ector	Phillips	R. B. Cowden (Bum) 1	Sec. 3, T-1-N Blk. 45	8,314	8,290	F. 226 BOPD+64 BW	Silurian	North Goldsmith Silurian
P-11		Stanolind	Scharbauer 3Q	Sec. 12, Blk. A	9,155	6,330	F. 398 BOPD	Tubb	Goldsmith Clear Fork
N-10	Winkler	TP Coal & Oil	E. E. Brown (Acct. 4) 1	Sec. 25, Blk. B-25	6,255	4,850	F. 265 BOPD	Holt	Emperor Holt
				Shallower-Pool Tests					
P-11	Ector	Phillips	TXL "E" 1-A	Sec. 39, Blk. 45	11,506	5,825	F. 139 BOPD	Clear Fork	TXL
P-11		Superior	Parker 7	Sec. 40, T-1-S Blk. 45	8,535	8,535	F. 314 BOPD	Silurian	TXL
O-10	Winkler	Stanolind & Shell	Waddell Bros. (Tr. 1) 1	Sec. 8, Blk. B-7	10,813	9,350	P. 125 BOPD+22 BW	Silurian	Wheeler
N-11		Humble	Walton 1-E	Sec. 20, Blk. 77	11,156	8,507	F. 660 BOPD	Silurian	Keystone Silurian
				Outposts					
O-13	Andrews	Lion	F. B. Redus *et al.* 1	Sec. 22, Blk. A-31	7,432	7,432	P. 100 BOPD	Clear Fork	Union
O-12		Atlantic	University "A" 1-11	Sec. 1, Blk. 11	9,060	9,060		Ellenburger	Martin Ellenburger
O-12		Mid-Continent	Lotus 1	Sec. 17, Blk. A-48	8,710	8,683	F. 1,222 BOPD	Devonian	Fullerton 8,500
O-12		Sun	N. C. Martin 2	Sec. 17, Blk. A-41	8,840	7,100	F. 165 BOPD+6% W.	Clear Fork	Martin
O-12		Stanolind	Lotus "A" 1	Sec. 16, Blk. A-48	8,593	7,106	F. 159 BOPD	Tubb	Fullerton
P-13		Texas	F. E. Gardner 2	Sec. 16, Blk. A-35	4,600	4,600	P. 100 BOPD	San Andres	Means
O-12	There were 11 successful outposts to the Block 12 field							Clear Fork	Block 12
P-8	Crane	Block 31 field had 19 successful outpost to the Devonian with 8 successful to the Ellenburger						Devonian Ellenburger	Block 31
P-9		Chandler Hill Corp.	Edwards "A" 1-A	Sec. 12, Blk. B-23	3,568	3,555	F. 132 BOPD	Grayburg	Waddell
R-14, 15	Dawson	Cascade	McLaurin 1	Sec. 52, Blk. M	4,900	4,900	P. 72 BOPD	San Andres	Welch
R-14, 15		Cascade	Handley 1	Sec. 36, Blk. M	4,919	4,919	P. 115 BOPD	San Andres	Welch
R-14, 15		Coates & Foster	V. K. Dupree 1	Sec. 51, Blk. M	4,887	4,887	P. 149 BOPD	San Andres	Welch
P-11	Ector	Phillips	TXL "G" 1	Sec. 11, T-1-S Blk. 46	10,677	10,625	F. 1,716 BOPD	Ellenburger	TXL
P-11		Texas	Fraser "E" 1	Sec. 9, T-1-S, Blk. 45	9,820	9,820	F. 1,921 BOPD	Ellenburger	TXL
P-11		Phillips	Thomas (Alma) 1	Sec. 42, T-1-N Blk. 45	9,825	9,700	F. 1,848 BOPD	Ellenburger	TXL
P-11		Phillips	TXL "K" 1	Sec. 41, T-1-S, Blk. 45	8,015	7,940	P. 119 BOPD+5% W.	Devonian	TXL
O-10		Samedan	G. C. Fraser 1	Sec. 11, T-1-S Blk. 46	8,658	8,658	182 BOPD+2% W.	Devonian	Wheeler Devonian

P-11		Humble	R. B. Cowden *et al.* "E" 1	Sec. 12, T-2-N, Blk. 45	8,666	8,666	F. 263 BOPD+141 BW	Ellenburger	Andector
P-11		Humble	R. B. Cowden *et al.* "F" 1	Sec. 11, T-2-N, Blk. 45	8,690	8,685	F. 980 BOPD	Ellenburger	Andector
P-13	Gaines	DeKalb Agric. Assn.	Colthorp 2	Sec. 12, Blk. A-24	7,145	7,145	P. 127 BO+27% W.	Clear Fork	Doss
P-13		Humble	M. S. Doss *et al.* 1	Sec. 1, Blk. A-24	7,181	6,562	P. 187 BO+20% W.	Clear Fork	Doss
P-13		Humble	Cunningham *et al.* 1	Sec. 7, Blk. A-24	7,135	7,135	F. 388 BOPD	Clear Fork	Doss
O-15		Amerada	E. H. Jones "B" 1	Sec. 3, Blk. A-6	11,455	11,395	F. 459 BOPD	Devonian	Jones Ranch
O-15		Amerada	E. H. Jones "C" 1	Sec. 2, Blk. A-6	11,544	11,298	F. 468 BOPD	Devonian	Jones Ranch
T-17	Garza	Honolulu & Devon.	Robinson 1	Sec. 1,302, GC&SFRR	3,600	3,545	P. 118 BOPD	San Andres	PHD
U-16		Lynn Oil Co.	Stoker "A" 1	Sec. 31, Blk. 5	2,817	2,817	P. 15 BO+4 BW	San Andres	Garza
U-16		Lynn Oil Co.	Connell (Lse 1) 1	Sec. 31, Blk. 5	2,960	2,960	P. 21 BO+5 BW	San Andres	Garza
U-16		Grisham-Hunter	Stoker 1	Sec. 4, Blk. 5	2,963	2,959	P. 92 BO+15 BW	San Andres	Garza
T-17		Honolulu	S. O. Sims 1	Sec. 1,207, D&W	3,600	3,567	P. 94 BOPD	San Andres	PHD
P-18	Hockley	Ballard & Cody	Richards 2	Lab. 5, Lge. 41	4,992	4,992	P. 525 BOPD	San Andres	Whiteface
Q-18		Ballard & Cody	Talley 1	Lab. 117, Lge. 733	4,845	4,845	P. 147 BOPD+15% W.	San Andres	Levelland
Q-18		Stanolind	Hamill 1	Lab. 21, Lge. 71	4,842	4,832	F. 111 BOPD	San Andres	Levelland
P-18		McCutchin	Coble 1	Lab. 15, Lge. 66	4,828	4,828	P. 508 BOPD	San Andres	Whiteface
U-12	Howard	Fleming *et al.*	TXL "C" 1	Sec. 23, T-1-S Blk. 30	2,922	2,922	P. 82 BOPD	Clear Fork	Snyder
V-15	Kent	Humble	Elkins 1	Sec. 36, Blk. 5	7,890	7,890	F 240 BOPD+50% W.	Ellenburger	Polar
V-13	Mitchell	Hickock & Reynolds	Ellett 1	Sec. 25, T-1-N, Blk. 29	3,153	2,800	P. 72 BOPD+20% W.	Clear Fork	Westbrook
V-13		Tobe Foster	Womack 1	Sur. 5, J. D. Pruitt	2,783	2,783	P. 22 BOPD	Clear Fork	No name
Q-6	Pecos	Helmerich & Payne	University 3-A	Sec. 10, Blk. 17	1,875	1,640	1,000,000 CFGPD	Queen	Taylor-Link
	Runnels	Gillespie Sons & Co.	J. H. Wilke 1	DL&C Survey	2,500	2,500	P. 12 BO+7 BW	Canyon	Huddleston
X-5	Schleicher	Cooper Gas Co.	Jess Koy "A" 1	Sec. 38, GH&SA Blk. L	5,700	5,700	F. 1,089 BOPD	Strawn	Page
V-13	Scurry	Robertson & McKissick	House 1	Sec. 117, Blk. 97	1,775	1,775	P. 240 BOPD	San Andres	Sharon Ridge
R-7	Upton	Gilcrease	University 1	Sec. 19, Univ. Lnd. Blk. 14	1,535	1,512	P. 6 BOPD	San Andres	Crockett
N-9	Ward	Lion	University "B" 6	Sec. 1, Blk. 18	4,941	4,941	28,000,000 CFGPD	Delaware	Pyote
O-9		Shell	Sealy-Smith Fdn 16	Sec. 23, Blk. A	5,002	5,002	F. 50 BOPD	Clear Fork	Monahans Clear Fork
O-10	Winkler	Sun	Wheeler "A" 1	Sec. 7, Blk. B-7	10,640	10,610	F. 634 BOPD	Ellenburger	Wheeler Ellenburger
N-11		Richardson & Bass	Walton 40-H	Sec. 9, Blk. B-3	4,755	4,740	F. 216 BOPD	Holt	Keystone
N-11		Sharp & Barnes	Crum *et al.* 1-H	Sec. 7, Blk. B-2	4,765	4,765	F. 519 BOPD	Holt	Keystone
N-11		Sharp & Barnes	Crum *et al.* 2-H	Sec. 7, Blk. B-2	4,765	4,765	F. 995 BOPD	Holt	Keystone
N-11		Sun	Keystone Cattle Co. 2	Sec. 4, Blk. 77	(old well plugged back)		F. 252 BOPD	Devonian	Keystone Devonian
N-11		Richardson & Bass	Bashara (Sec. 21) 6-E	Sec. 21, Blk. 77	9,909	9,909	F. 2,218 BOPD	Ellenburger	Keystone
N-11		Richardson & Bass	Jenkins 7-E	Sec. 13, Blk. 77	9,905	9,905	F. 650 BOPD	Ellenburger	Keystone
N-11		Richardson & Bass	Walton 42-E	Sec. 2, Blk. B-3	9,745	9,745	F. 1,017 BOPD	Ellenburger	Keystone
N-11		Carter & The Pure	Walton Tr. "D" 14-E	Sec. 5, Blk. B-2	10,000	10,000	F. 1,877 BOPD	Ellenburger	Keystone

feet and encountering pre-Cambrian granitic rock, it was plugged back and completed, flowing 238 barrels of distillate and oil, plus 15 per cent salt water. The pay section was acidized.

In the extreme southeast part of the Midland basin, in Sutton County, *X-3*, the Shell Oil Company's Duke Wilson No. 1 produced 9,200,000 cubic feet of gas per day from Strawn limestone beds, at approximately 4,200 feet. This well was drilled to test the Ellenburger and encountered water in that objective at 5,900 feet. The upper 1,110 feet of Ellenburger showed no fluid.

In Schleicher County, *X-5*, the Cooper Gas Company's Jess Koy "A" No. 1 was started as a northwest outpost to the Page gas area. At 5,200 feet, a reef-like limestone of Pennsylvanian age was encountered, at a stratigraphic level higher than the producing area at the south. The well was drilled to 5,700 feet and was dually completed as an oil well, producing 1,089 barrels per day from 5,520 to 5,645 feet, and as a gas well, producing 24,700,000 cubic feet per day from 5,350 to 5,410 feet.

In northeastern Crockett County, *V-6*, the Stanolind Oil and Gas Company's University "GG" No. 1, which has been drilled to 8,384 feet, is now shut in at a plugged-back depth of 8,377 feet. This well showed considerable gas and distillate at the contact of the Pennsylvanian and Ellenburger beds at 8,000 feet. It is now shut in because mechanical difficulties rendered a satisfactory completion virtually impossible. These difficulties appear to be inevitable when repeated perforations, squeeze jobs, and acid treatments are made opposite the Ellenburger dolomite.

The Stanolind test was drilled on a prominent anomaly which had been localized by seismic work. It proves the presence of a large structure in the vicinity and is an excellent example of the effectiveness of refraction shooting on the Edwards Plateau.

Important dry holes.—In southeastern Irion County, John I. Moore's Elta T. Murphy No. 1, *V-7*, was drilled to 8,389 feet and an unsuccessful attempt was made to complete the well as a producer from the Ellenburger dolomite, which had shown some gas and distillate near the Pennsylvanian-Ellenburger unconformity near a depth of 8,000 feet.

The Humble Oil and Refining Company's Sawyer Cattle Co. "C" No. 1, *T-8*, also penetrated the Ellenburger in this part of the Midland basin, furnishing further regional information but failing to encounter oil or gas in drilling to 9,960 feet.

In west-central Crockett County, *U-4, 5*, Loffland Brothers' V. B. Cox No. 1 was drilled to 10,939 feet, penetrating about 700 feet of Ellenburger before being abandoned. This test furnished important regional information regarding the pre-Permian of the Southern shelf and Sheffield Channel area.

CENTRAL BASIN PLATFORM

Permian discoveries and developments.—In Crockett County, *S-6*, Moore Brothers' Halff-Bivens No. 1, southeast of the Yates field, penetrated the Ellen-

burger in drilling to 7,512 feet and encountered water. The well was plugged back and completed as a small producer from the San Angelo silt and dolomite beds.

In Ector County, west of the North Goldsmith pool, Stanolind's Jessie M. Williamson No. 1, *O-11*, was completed in the San Andres dolomite as a small producer, after plugging back from the total depth of 10,290 feet. The well was drilled to the Ellenburger and was dry in all pre-Permian formations, but furnished important regional information.

Two Permian zones were found productive around the edge of the TXL field, in West Ector County, *O, P-10, 11*. The Phillips Petroleum Company's TXL "E" No. 1 was drilled to 11,506 feet and was dry in the Ellenburger. It was plugged back and completed in dolomite beds of upper Clear Fork age at 5,825 feet. This well is southeast of theTXL field and added further critical information regarding the pre-Permian folding in this area. The Shell Oil Company, Inc., and the Arkansas Fuel Oil Company's E. R. Thomas Estate "E" No. 1 was completed, pumping a small amount of oil and water from Wolfcamp beds between 7,545 and 7,615 feet. This well is on the extreme southwest edge of the TXL field and was dry in the Devonian chert beds, one of the main producing zones of the field.

The first Tubb (lower Clear Fork) oil produced in Ector County was found in 1946 with the completion of the Stanolind Oil and Gas Company's C. Scharbauer No. 3-Q, *P-11*, on the north end of the Goldsmith dome. The well was drilled to 9,155 feet and, though it occupied a high regional structural position, was dry in the Ellenburger. It was plugged back and completed in the Tubb zone, producing 398 barrels of oil per day, between 6,090 and 6,290 feet. Several additional wells have been completed in this reservoir north and south of the test and this production will probably rank as one of the two major Permian discoveries of 1946.

In Winkler County, *O-1*, Ralph Lowe developed upper Clear Fork production in his Sealy-Smith No. 1 at a depth of 5,300 feet. This well was dry in the Tubb (lower Clear Fork) zone, which is the producing formation in the North Monahans field, located 3 miles east. Upper Clear Fork production was also obtained 1 mile south of the North Monahans field with the completion of Stanolind's Sealy-Smith "A" No. 8, at 5,224 feet.

In the Emperor Deep pool, *N-10*, upper Clear Fork production was discovered by the Texas-Pacific Coal and Oil Company with the completion of its E. E. Brown (Acct. 4) No. 1, as a deeper pool test, at a total depth of 4,947 feet. The well was drilled to 6,255 feet, at which depth it tested water in the Tubb zone, and was plugged back as a successful completion. The few wells completed in this zone in the local area to date have had a thin oil column and excessive gas-oil ratios. Present development does not indicate any appreciable extent of this reservoir.

In Andrews County, *O-12*, the Superior Oil Company's Eva Coopwood No. 1 was a discovery in the Fullerton zone (lower Clear Fork or Tubb) after being

TABLE IV

SUCCESSFUL EXPLORATORY WELLS—NEW MEXICO, 1946

Map Co-ord.	County	Operator	Farm	Location	Total Depth (Feet)		Initial Production	Producing Formation	Pool—New or Extended
					Drilled	Producing			
New Field Wildcat									
I-18	Chaves	DeKalb	Lewis 1	13-10S-25E	5,650	1,275	P. 6 BOPD+9 BW	San Andres	Bitter Lake
Outposts									
L-16	Chaves	Great Western	Maxwell 1-B	12-13S-31E	3,056	3,056	F. 432 BOPD	Queen	Caprock
K-15	Eddy	Yates	Robinson 1-B	34-17S-29E	3,207	3,207	F. 250 BOPD	San Andres	Grayburg-Jackson
L-16	Lea	Williams	Williams 1	8-13S-32E	3,072	3,072	F. 60 BOPD	Queen	Caprock
L-15	Lea	Boller-Rutledge	Iles 1	10-17S-32E	3,974	3,974	F. 40 BO 4H	Grayburg	West-Roberts
N-13	Lea	Humble	Hardison 1	34-21S-37E	6,585	6,560	F. 182 BO 6H	Yeso-Clear Fork	Drinkard
N-13	Lea	T. & P.	State A 36	11-22S-36E	3,939	3,490	4,000 MCF	Yates	South Eunice
N-12	Lea	T. & P.	State 16	11-23S-36E	3,824	3,555	4,186 MCF	Seven Rivers	Cooper-Jal
Deeper Pool Tests									
I-14	Eddy	Aston-Fair	State 1-X	31-17S-28E	1,704	1,704	1,090 MCF	Grayburg	Unnamed
N-13	Lea	Barnsdall	Hardy 1	29-21S-37E	6,652	6,652	F. 135 BOPD	Yeso-Clear Fork	Drinkard
N-13	Lea	Repollo	State 367	36-21S-37E	6,542	6,500	F. 198 BOPD	Yeso-Clear Fork	Drinkard
N-13	Lea	Mid-Continent	Owen 2	3-22S-37E	5,255	5,177	P. 3 BOPD+40 W.	Glorieta	Paddock
N-13	Lea	Rowan	Walden 3	15-22S-37E	7,581	7,565	F. 722 BOPD	Ellenburger	Brunson
M-13	Lea	Ohio	Muncy 1	24-22S-37E	7,298	6,906	F. 264 BOPD+	Yeso	Drinkard
Shallower Pool Tests									
N-14	Lea	Std. of Texas	*State 1	29-18S-38E	4,191	3,170	F. 55 BO 2½ H	Seven Rivers	Bowers
N-14	Lea	Continental	*B-23 Skaggs 4	23-20S-37E	7,900	6,837	F. 111 BOPD	Yeso-Clear Fork	Weir
M-11	Lea	Gulf	*Paddock 3	1-22S-37E	7,064	6,250	F. 32 BOPD	Yeso Clear Fork	Unnamed
M-11	Lea	Clay *et al.*	Cowden 1	30-23S-37E	3,636	3,081	15,000 MCF	Yates	Unnamed

* New-pool discovery but no exploratory footage.

completed at 7,003 feet. This well is on another small fold on a regional trend south of the main Fullerton producing area.

The Texas Company's (formerly The Atlantic Refining Company's) University "P" No. 1 was completed in the lower part of the Tubb producing zone at a plugged-back depth of 7,250 feet, as the discovery well of the Block 12 field, *O-12*. Initial production was 159 barrels of oil per day. This well was drilled into the Devonian limestone before it was plugged back for completion. It is on a prominent structure which had been known since 1941 and on which during that year The Atlantic Refining Company drilled a well to the Ellenburger.

An intense drilling campaign, designed to validate short-term leases on University land, was underway in this field during the late summer and autumn of 1946.

While the Block 12 field will be found to cover a considerable area, all wells to date have been small producers. Present developments, in the light of favorable structure, have been disappointing. Even so, it will rank as a major discovery for the year.

On the west flank of the Means field, *P-13*, H. W. Snowden's F. E. Gardner No. 1 was drilled as an outpost to the San Andres producing area and encountered a porous zone in the lower Grayburg dolomite, above the regular producing zone of the area, at 4,450 feet.

Northward, in Gaines County, considerable development occurred in the Doss field, *O*, *P-14*, which is producing from the Tubb producing zone. Development indicates this will be a large reservoir.

There were several smaller discoveries, extensions, and deeper producing formations recorded in the south Ward County-north Pecos County area, along the west side of the Central Basin platform. Most of these developments were in stratigraphic levels between the Yates sand and the Grayburg dolomite.

In Lea County, New Mexico, in the Paddock pool, *N-13*, The Mid-Continent Petroleum Corporation deepened its Owen No. 2 in Sec. 3, T. 22 S., R. 37 E., a shallow well on the eastern margin of the Penrose-Skelly pool, to 5,255 feet. The well was plugged back to 5,157 feet and on potential test it pumped 3 barrels of oil and 40 barrels of water per day from the Paddock reservoir. This was a 1½ mile west extension of the Paddock pool and, although the well was subsequently plugged, there has been a steady westward growth of the pool through most of the intervening area. West of the Owen well this zone has been somewhat erratic, but production from this zone has been established in scattered wells an additional 1½ miles farther southwest to Section 8 of this township, thereby overlapping a part of the Penrose-Skelly pool.

In the Drinkard pool, *N-12, 13*, the Humble Oil and Refining Company's Hardison "B" No. 1, Sec. 34, T. 21 S., R. 37 E., provided one of the most important extensions when, at the total depth of 6,585 feet, the well tested 182 barrels of oil in 6 hours, from the Drinkard producing zone (lower Clear Fork). This significant outpost extended the Drinkard pool 2½ miles north.

On the north margin of the Paddock pool, the Repollo Oil Company's State-367 No. 1, Sec. 36, T. 21 S., R. 37 E., found water in the Paddock zone and was deepened to 6,542 feet and produced 198 barrels of oil per day from the Drinkard reservoir. This represented an eastward extension of 1½ miles and indicated the overlapping of the Paddock and Drinkard pools.

The Drinkard pool was further extended 1½ miles north when the Barnsdall Oil Company deepened its Hardy No. 1 in Sec. 29, T. 21 S., R. 37 E., to 6,652 feet in the Drinkard zone, where it flowed 135 barrels of oil in 24 hours.

As a result of these 3 extensions of the Drinkard pool, a rather spirited drilling campaign has been under way in the vicinity of the Eunice townsite, and in several locations twin wells have been drilled on the same 40-acre unit to test separately the overlapping Paddock and Drinkard producing zones.

The Weir pool, *M, N-14,* was discovered by the Continental Oil Company's Skaggs "B" 23 well No. 4, in Sec. 23, T. 20 S., R. 37 E. This well was drilled to 7,900 feet to test the Pennsylvanian formation of the Cass pool, but as it was not productive, the well was plugged back and completed through perforations between 6,760 and 6,837 feet. The oil-bearing zone was acidized and the well completed in May, 1946, producing 111 barrels of 37° gravity oil from dolomite beds, the approximate stratigraphic equivalent of the Drinkard producing beds in the Yeso-Clear Fork formation. At the close of the year production in the Weir pool was limited to one well, although the producing formation had been tested unsuccessfully in one other well in this area.

The Humble Oil and Refining Company's Bowers No. 1, *N-14,* Sec. 30, T. 18 S., R. 38 E., which was completed in 1930, is credited with the discovery of the shallow Bowers producing zone of the Hobbs field, but because of the flush production encountered in the underlying San Andres dolomite, the Bowers zone was not developed. The exploitation of this long dormant shallow reservoir was initiated by the Standard Oil Company of Texas in October, 1946, when that operator re-completed its State well No. 1, in Sec. 29, T. 18 S., R. 38 E., by plugging back and perforating casing between 3,148 and 3,170 feet. The well tested 55 barrels of 41.6° gravity oil in 2½ hours, flowing from the Bowers sandstone. This sandstone unit is a member of the Seven Rivers formation and occurs at an average depth of 3,200 feet in the Hobbs field. The name Bowers was assigned to the shallow pool, and at the close of 1946 there were 5 producing wells, one of which was drilled solely to test this reservoir.

Pre-Permian discoveries and developments.—On the Central Basin platform most of the pools discovered in the pre-Permian were small, although several contributed important reserves.

In Pecos County in the shallow White and Baker pool, *R-6,* Helmerich and Payne, Inc., developed Strawn limestone production in the White and Baker "C" No. 8, between 7,585 and 7,700 feet. This hole had been drilled in 1934 by Humble Oil and Refining Company to 9,811 feet and was abandoned after encountering sulphur water in the Ellenburger. After Helmerich and Payne ac-

quired the property, the cuttings were examined for fluorescence. Based on the evidence obtained, they cemented casing at 8,087 feet and completed the well for 176 barrels of oil, after acidizing. A west offset to this well was dry in all formations below the shallow producing formation.

In Crane County, on the southwest flank of the Sand Hills uplift, Humble's N. M. Tucker *et al.* No. 1, *P-8*, produced 6,300,000 cubic feet of gas per day, from the Waddell sandstone member of the Simpson at 5,700 feet. This well tested the Ellenburger and, finding water, was plugged back to the Waddell sand.

In the same part of Crane County, about 2 miles northwest of the Humble well, the Standard Oil Company of Texas completed its Nellie M. Tucker No. 1,

TABLE V

CENTRAL BASIN PLATFORM

Pre-Permian Fields with New Pre-Permian Producing Formations in 1946*

Field and County	*Regular Producing Formation*	*Depth (Feet)*	*New Producing Formation*	*Depth (Feet)*	*Indicated Extent*
Keystone Winkler	Ellenburger	9,500	Fusselman	8,400	Over entire fold—variable porosity
Keystone Winkler	Ellenburger	9,500	Devonian	8,000	Around N., E., and SE. sides
TXL Ector	Devonian	8,000			
	Ellenburger	9,600	Fusselman	8,535	Over entire fold
Martin Andrews	Clear Fork	—			
	McKee sand	8,400	Ellenburger	8,800	Over entire fold—main producing formation
Fullerton 8500 Andrews	Devonian	8,500	Ellenburger	10,700	Over entire fold

* It is not intended to convey the impression that newly discovered pays for the area are listed. A field is included in this category only if a well has been *completed and is producing* oil from a new producing formation.

P-8, in the Waddell sand between 5,750 and 5,780 feet, producing 127 barrels of oil and/or distillate per day. This test offsets a 1945 discovery which pumped oil from the same reservoir.

In the central part of Crane County, the Block 31 field, producing from the Devonian and Ellenburger, was very active with the completion of 20 outposts, only one of which was dry.

In Ector County, at the north edge of the Penwell field, the Phillips Petroleum Company *et al.* Eidson-Scharbauer No. 1, *P-10* was completed in the Ellenburger dolomite at 8,978 feet, after plugging back from a drilled depth of 9,020 feet. After a short period the well was worked over and re-completed, producing about 50 barrels of oil and 15 barrels of water per day at a plugged-back depth of 8,915 feet, approximately 25 feet in the Ellenburger. This completion served to stimulate deep drilling southward under the main part of the Penwell-Jordan area.

Northwest of the Phillips discovery, John W. Murchison developed a small well in the Devonian chert beds at 8,566 feet, with the completion of his G. C. Fraser No. 1, *P-10*, which pumped 29 barrels of oil and 33 barrels of water in 24 hours. This well is on the flank of a regional anticlinal axis.

In Winkler County, *N-11*, rapid development of the Keystone-Ellenburger

reservoir continued throughout 1946 and there were 130 wells producing from that pool as of December 31, 1946. In addition, Devonian oil was produced at different points around the margin of the Ellenburger producing area and Silurian oil was also produced on the west edge of the structure. These two new pre-Permian producing formations in the Keystone caused it to continue a most active area on the Central Basin platform.

On the east flank of the TXL field, a separate closure was found by The Texas Company at its G. C. Fraser "D" No. 1, *O, P-10*, with the reservoir on this closure apparently controlled by a normal fault on the west. The Fraser "D" No. 1 is producing from the Ellenburger at a sea-level datum about 1,200 feet lower than the oil-water contact in the TXL Ellenburger pool proper.

Intense exploitation of the Devonian and Ellenburger reservoirs of the TXL field continued during 1946, and a 1½ mile north extension of the Ellenburger producing pool was completed by The Texas Company's G. C. Fraser "F" No. 1. Silurian oil was also produced for the first time in the TXL field with the completion of the Superior Oil Company's J. E. Parker No. 7, in the extreme south part of the field.

In northwestern Ector County, the Stanolind Oil and Gas Company deepened a wildcat which had been abandoned several years previously, and found oil in the Devonian chert beds, in contact with overlying Permian, at 7,919 feet. The well, Stanolind's Grisham-Hunter Corporation No. 1, *O-11*, was drilled to 7,956 feet and produced 445 barrels of oil per day as the discovery well in the North Goldsmith Devonian pool. Silurian oil was produced later in the North Goldsmith area, with the completion of the Phillips Petroleum Company's R. B. Cowden "Bum" No. 1 at 8,290 feet.

Along the Ector County-Andrews County line, *O-11*, southwest of the Embar uplift, the Humble Oil and Refining Company's R. B. Cowden "B" No. 1 was completed in the Ellenburger dolomite as the discovery well of the Andector field. Its daily potential was 1,076 barrels of oil, at 8,600 feet.

In Andrews County, *O-12*, on a separate fold between the Embar uplift and the south end of the Fullerton pool, the Martin pool was expanded and in addition Ellenburger oil was found at 8,800 feet. The Ellenburger was the third productive formation discovered on this structure and is the most prolific pool in the field.

In west-central Andrews County, *O-12*, the Placid Oil Company and the Gulf Oil Corporation completed M. A. Thornberry No. 1 as a pumping well in the Ellenburger dolomite, producing 33 barrels of oil and 729 barrels of water per day. This well is producing at the total depth of 11,957 feet and is the deepest producing well in the Permian basin to date.

In western Andrews County, the Nelson field, *N, O-12*, was discovered by the Shell Oil Company, with its A. Nelson No. 1, producing 475 barrels of oil per day from the Ellenburger at the total depth of 10,606 feet. This discovery was drilled on the basis of seismic information.

Farther north, along the west side of Andrews County and apparently on a fold subsidiary to the major structural uplift associated with Penrose-Skelly field of Lea County, New Mexico, the Freund field was discovered by the Humble Oil and Refining Company with the completion of its H. O. Sims No. 2, *N-13*. Initial production was 704 barrels of oil per day from the Ellenburger dolomite at the total depth of 10,535 feet. This strike should serve to increase prospecting on the east side of the uplift.

In Lea County, New Mexico, in the Brunson pool, *N-13*, a 1-mile southeast

TABLE VI

NUMBER OF WELLS DRILLED TO PRE-CAMBRIAN

Geological Province	*Number*
Northwestern shelf	4
Matador uplift	1
Central Basin platform	33
Midland basin	1
Eastern platform	1
Total	40

extension was assured when the Rowan Drilling Company and Neville G. Penrose completed their Walden No. 3, flowing 722 barrels of oil, natural, in 24 hours from the Ellenburger dolomite. This well is located in Sec. 15, T. 22 S., R. 37 E., and was drilled to 7,581 feet in granite. Five and one-half inch casing was cemented on bottom and perforated between 7,490 and 7,565 feet. The extension is notable in that a well drilled previously one location east found Permian beds in contact with pre-Cambrian; and in another well approximately $\frac{3}{4}$ mile northwest, no Ellenburger had been encountered, although in the latter place a thin wedge of Simpson separated the Permian from the pre-Cambrian.

The Brunson pool grew steadily during 1946 and of its 16 producing wells, all except the discovery well were completed during that year. Only on the east, where the Ellenburger dolomite pinches out against the pre-Cambrian, have the limits of the pool been defined, and from the information available, this pool appears to contribute one of the most important additions to the reserves of this district.

Since there is locally an overlapping of the Paddock, Drinkard, and Brunson pools, twin wells to separate producing beds, in most places the lower two, are drilled. Rarely 3 wells on a single unit have been drilled to test the 3 pre-San Andres reservoirs common to the area. The concentration of drilling in the area is reflected by 45 wells completed in the Paddock pool, 63 in the Drinkard pool, and 15 in the Brunson pool, or a total of 123 wells in 1946.

Important dry holes.—On a trend northwestward from the Yates field, the Gulf Oil Corporation's G. R. White *et al.* No. 1, *R-6*, was drilled 8,225 feet and failed to encounter oil in the Ellenburger dolomite.

Northward from this test along the line of Crane and Upton counties in the vicinity of McCamey, *Q-8*, 5 dry wildcats were drilled into the Ordovician rocks

between the McCamey and McElroy fields. An area of complex structural relationships was revealed. Definite evidence of normal and reverse faulting, in the same well bore, was found in two wells.

North of the Sand Hills producing area, *P-9*, Gulf's M. B. McKnight No. 8-E was drilled to 8,845 feet and failed to find commercial oil in testing the Ellenburger. This test defined the sharp north margin of the Sand Hills uplift.

In Ector County, in the Penwell-Jordan area, *P-10*, 2 wildcats were drilled to the Ellenburger at 9,300 and 9,675 feet, respectively. These wells are southeast and southwest of the Phillips discovery and indicate the pre-Permian structural axis of this part of the Penwell field.

On the west flank of the Harper field, *P-10*, the Cities Service Oil Company drilled to 12,529 feet in its J. E. Parker No. 1, and failed to develop commercial production in the Ellenburger. This test contributed materially to the regional structural knowledge of the Central Basin platform.

In the extreme southwest corner of Andrews County, the Humble Oil and Refining Company's E. P. Cowden No. 1, *N-11*, was drilled to 10,757 feet as an outpost to the Dollarhide field. This test was abandoned after failing to develop production in the Devonian chert beds, which are productive in the Dollarhide field. It occupies a structural position about 2,500 feet lower than the producing area, 1 mile west.

In the Hendrick field, in Winkler County, *N-11*, Stanolind's T. G. Hendrick T-88-M No. 35-A was drilled to the Ellenburger and abandoned at 13,815 feet. It penetrated the pre-Pennsylvanian beds of the deep producing areas on the east, but showed no signs of oil.

Since this was the first hole drilled through the reef dolomites of the Hendrick field, interesting drilling problems were encountered because of cavernous porosity. Several intervals of 200–300 feet thickness were drilled without circulation. The excessive amount of water needed for this type of drilling caused the operator to take water from producing wells in the field, with many interesting consequences as fluid equilibria were disturbed.

In Lea County, New Mexico, relatively thick pre-Permian sediments were indicated in the stratigraphic section revealed in the Repollo Oil Company's Simmons No. 1 in Sec. 25, T. 21 S., R. 37 E., on the northeast flank of the uplift associated with the Penrose-Skelly field. However, the well was abandoned in dolomitic rocks of Siluro-Devonian age at 8,755 feet, after a drill-stem test returned sulphur water from 8,490–8,570 feet.

NORTHWEST SHELF AREA

Permian discoveries and developments.—The Bitter Lake pool, *I-17*, in Chaves County, New Mexico, was the only successful new-field wildcat drilled in Southeastern New Mexico in 1946. The De Kalb Agricultural Association of Illinois drilled its Nellie Lewis No. 1 in Sec. 13, T. 10 S., R. 25 E., to 5,650 feet in pre-Cambrian granite, plugged back to 1,275 feet in the San Andres formation and,

after 7,500 gallons of acid were used, the well on potential test pumped 6.66 barrels of oil and 9 barrels of water per day. The marginal nature of this discovery did not stimulate additional drilling in the field. Magnetic information influenced the location of the well site.

In the Caprock field of Lea and Chaves counties, New Mexico, *K-16, 17, 2* outpost wells, the Great Western Producers, Inc., Maxwell "B" No. 1 in Sec. 12, T. 13 S., R. 31 E., and Sam Williams' Williams No. 1, Sec. 8, T. 13 S., R. 32 E., extended production in the field $\frac{3}{4}$ mile south and $\frac{3}{4}$ mile southeast, respectively. The Maxwell "B" No. 1 produced 432 barrels per day and the Williams No. 1 produced 60 barrels per day, flowing from the Queen sandstone at the respective depths of 3,056 and 3,072 feet. Development in the pool reached its maximum during 1946. Thirty-five wells were completed during 1946 as compared with 31 wells drilled from the date of discovery in 1940 through 1945. At the close of 1946 the pool continued to grow toward the south and southeast where no defining limits were yet apparent.

Important unsuccessful new field wildcats.—In DeBaca County, New Mexico, the Pure Oil Company's Pure No. 1, in Sec. 31, T. 2 N., R. 28 E., drilled largely on a combination of surface and seismic information, penetrated 1,600 feet of Pennsylvanian sediments and reached 6,469 feet in the pre-Cambrian without encountering any encouraging showings of oil or gas.

In Chaves County, New Mexico, the Richfield Oil Corporation's Federal Coll No. 1, Sec. 18, T. 11 S., R. 27 E., drilled on the basis of seismic information, contributed data of particular significance, the result of which was a lease play along the Pecos Valley in an area 50 miles wide and 90 miles long. This test encountered pre-Permian sediments, the lowest 200 feet of which are correlated as Ellenburger. The well was drilled to 6,630 feet in pre-Cambrian rock. Although initial testing indicated as much as 300,000 cubic feet of gas per day, after 5,250 gallons of acid were used, the well flowed an estimated 30 barrels of salt water per hour and was plugged and abandoned.

The Magnolia Petroleum Company's Black Hills Unit No. 1, Sec. 31, T. 17 S., R. 20 E., in the extreme southwest corner of Chaves County, New Mexico, was located on a surface structure and focused attention to that area. The well was stopped at 6,085 feet in metamorphic rock after penetrating a relatively thick section of marine sediments reportedly including beds of Ordovician age.

NORTH BASIN PLATFORM AND MATADOR UPLIFT

Permian discoveries and developments.—In Hockley County the Levelland field, *Q-18*, had several extensions which point to its developing into a major oil pool, of the same type as the Slaughter field on the south. The Levelland field is producing from San Andres dolomite beds stratigraphically below the Slaughter producing formation, with the occurrence of oil believed by some to be controlled in part by regional lithologic variation within the lower San Andres.

In Hale County, *R-19*, Stanolind's Lee Irish No. 1 was completed at 5,881

feet in lower Clear Fork dolomite beds as the discovery well of the Irish field. This well was drilled on a seismic prospect and is about 4 miles east of the Anton field in Lamb County. There were 3 producing wells completed before the end of 1946.

Pre-Permian discoveries.—In southeastern Hale County, *S, T-19,* Stanolind's E. L. Fisher No. 1 was completed in a Pennsylvanian limestone, probably Cisco in age, at 6,992 feet, producing 1,342 barrels of oil per day. This discovery was drilled as a result of a combination of geophysical information and has caused active leasing. The well is in a new producing formation of the area and is the most important discovery in the south plains province.

The Fisher discovery is north of, and structurally lower than, a well drilled several years ago by Stanolind, Humble, and Standard of Texas, and will rank as a significant discovery of the year and may go far toward opening a new producing province in West Texas.

Important dry holes.—In Curry County, New Mexico, Humble's Northcutt No. 1, Sec. 32, T. 8 N., R. 37 E., reached 7,502 feet in arkosic beds, probably Pennsylvanian in age. No definitely favorable reservoir rocks were found.

In Yoakum County, Texas, on a northwest trend from the Wasson field, the Drilling and Exploration Company's A. J. Davis "D" No. 1, *O-16,* was drilled to 10,774 feet and failed to encounter oil in the Devonian dolomite, which is productive in the Jones Ranch field on the south, *N, O-15.* Eastward, also in Yoakum County and on the east flank of the Wasson field, the Honolulu Oil Corporation's T. D. Hovencamp No. 9 was drilled to 11,592 feet and was abandoned before the Devonian beds were reached. It furnished important information on regional and local structure.

Near the southeast limits of the Slaughter field, along the Hockley County-Terry County line, Honolulu's W. G. Frazier No. 24 was drilled to 7,708 feet and tested the lower Clear Fork but found no indication of oil. This is the most southeasterly deep test in the Slaughter field.

Farther north in Hockley County, along the Lamb County line, a south outpost to the Anton field, Humble's L. P. Campbell No. 1, was drilled into igneous or meta-igneous material in reaching the total depth of 11,760 feet, furnishing important stratigraphic information of a regional nature and revealing structural relief on the order of 3,000 feet along the south side of the Anton field.

In Bailey County, *O-20,* John W. Naylor drilled his Maple Wilson *et al.* No. 1 to 6,003 feet and found no favorable showings of oil in testing the lower Clear Fork.

In Dickens County, *V-19,* Humble's Matador Land and Cattle Company "B" No. 3 was drilled to 8,230 feet and was dry in Mississippian limestone beds. This test added to the general information of the area of the Matador uplift.

DELAWARE BASIN

In the Delaware basin in 1946 a lease acquisition program was begun following the showing of oil in deeper Permian beds in the Argo Oil Corporation's Dora

Roberts No. 1, *L-7*. From sandstone and silt beds at 10,047 feet a slight amount of distillate was recovered on a drill-stem test. Further testing in various zones through the next 1,500 feet of beds showed other possible oil zones.

Though the well is not officially listed as a 1946 completion, it is the most important test drilled in the Delaware basin to date and furnished invaluable regional stratigraphic and structural information. The Permian beds, representing the sequence from Castile to Wolfcamp time, showed a thickness in excess of 12,000 feet.

Since this was the deepest operation in the Permian basin in 1946, it should be pointed out that the well was drilled through a predominant shale and sandstone section, with open 6¼-inch hole from 5,166 feet to the total depth of 14,073 feet, with no serious mechanical delay or deviation from vertical.

The Continental Oil Company's F. H. Scott No. 1, on the south line of Ward County, *M-8*, had an initial daily pumping potential of 6 barrels of oil from the Delaware sand at 4,920 feet. It was the only discovery in the Delaware sand beds in 1946.

Important dry holes.—The Phillips Petroleum Company's Elsinore Cattle Company No. 1, in the south part of Pecos County, *O-4*, and about 28 miles west, of that company's one-time world's deepest test (Ada Price No. 1), was drilled to 12,096 feet and was abandoned in beds of Wolfcamp age, furnishing further information on the southeast part of the Delaware basin. This location is related to the Sierra Madera folding.

In Winkler County, *M-11*, R. R. Herrel *et al.* Burton Lingo Lumber Company No. 1 defined further the relations of the steeply dipping reef front and the Delaware basin, in drilling to 5,156 feet. This well was 2,500 feet lower structurally than the Hendrick field, 5 miles east.

DIABLO PLATFORM

Of regional importance because of its location near the west edge of the Diablo platform in Hudspeth County, Albert R. Jones' William Melbreth No. 1, *D-8*, was abandoned in dolomite beds (possibly Ordovician) at 4,518 feet, after encountering water. A considerable thickness of Lower Permian dolomite was drilled as well as limestones and dolomites of pre-Permian age.

The Union Oil Company of California drilled its McMillan 1-A, Sec. 9, T. 25 S., R. 13 E., Otero County, New Mexico, to 5,215 feet in the El Paso limestone (Lower Ordovician), where the well encountered a hole full of water and was abandoned.

GEOLOGICAL ACTIVITY

There was a significant increase in almost every phase of geophysical activity in the West Texas-Southeastern New Mexico area during 1946 (Table II).

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DEVELOPMENTS IN ARIZONA, WESTERN NEW MEXICO, AND NORTHERN NEW MEXICO IN 1946[1]

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ABSTRACT

Although no new fields were discovered during 1946, there was considerable activity in both proved and wildcat territory. At the Barker Creek dome two additional deep gas wells were completed and a desulphurizing plant was built. Fifteen gas wells completed in the Fulcher Basin field established its continuity with the Kutz Canyon field. The Estancia Valley carbon-dioxide field was abandoned, but additional development in the Bueyeros area was started.

Two dry holes were completed in Arizona and ten in northern New Mexico. Five of these reached the pre-Cambrian. Intense geophysical, geological, and leasing activity centered in the San Juan basin.

Twelve publications on parts of the region appeared, in which large areas were mapped and discussed and a number of new stratigraphic names were presented.

INTRODUCTION

The district here considered includes all of Arizona and the northern and western three-fourths of New Mexico (Fig. 1). Twelve fields, all in the San Juan basin, produced 448,757 barrels of oil and 5,274 million cubic feet of gas in 1946, and one small field in northeastern New Mexico produced carbon-dioxide gas (Table I).

DEVELOPMENT

Field development, all in northwestern San Juan County, involved the Barker Creek deep gas field, the Fulcher Basin field, and the Blanco area. On the Barker Creek dome the Southern Union Production Company completed two large Pennsylvanian gas producers as extension wells, respectively one mile southwest and ¾ mile southeast of the discovery well. These completions bring the total of deep wells on this dome to four, which are summarized in Table II. A fifth was drilling at the end of the year. In 1946 Southern Union also put into operation a $500,000 desulphurizing plant at Barker Creek, to treat the sour gas from the deep wells, and started an extensive program of enlarging and improving its pipe line and booster stations between northwestern New Mexico and Albuquerque.

Since 1942, twenty-eight gas wells have been completed in the Fulcher Basin field, of which more than half were drilled in 1946. This recent drilling has shown that the field is continuous with the Kutz Canyon field on the southeast; the two occupy a northwest-trending belt 14 miles long by less than 2 miles wide. The gas is found in a stratigraphic trap in sandstones of the Mesaverde formation, at an average depth of 1,900 feet. Initial productions have ranged from 310,000 to 2,210,000 cubic feet per day, with an average of 1,117,000 cubic feet.

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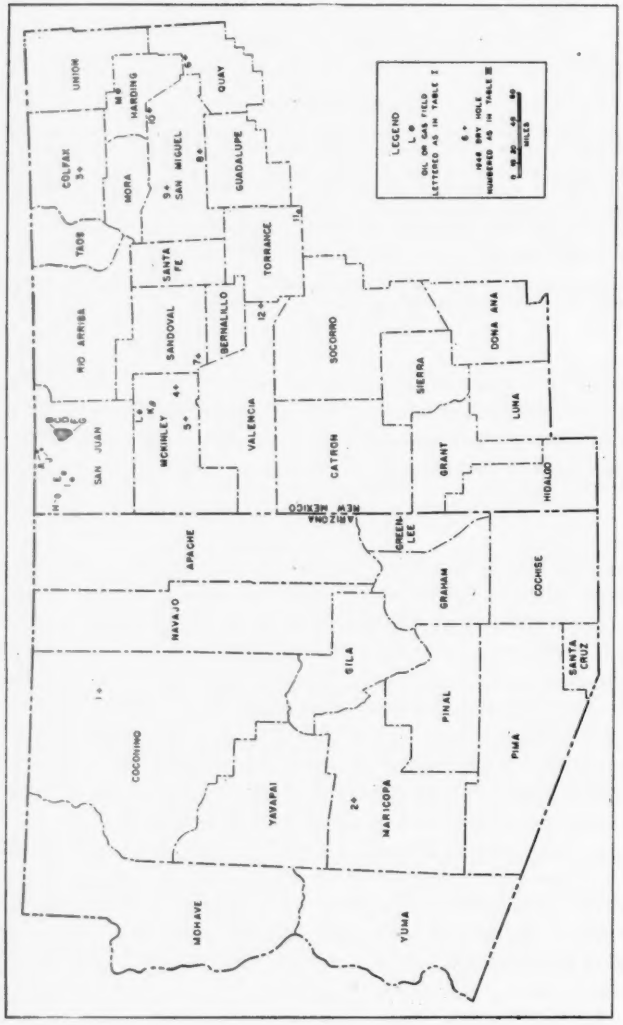
LEGEND
L 6 OIL OR GAS FIELD LETTERED AS IN TABLE I
6 • DRY HOLE NUMBERED AS IN TABLE III
0 20 40 60 MILES
UNION
HARDING
QUAY
COLFAX
MORA
SAN MIGUEL
GUADALUPE
TAOS
SANTA FE
TORRANCE
RIO ARRIBA
SANDOVAL
BERNALILLO
SOCORRO
DONA ANA
SIERRA
SAN JUAN
MCKINLEY
VALENCIA
CATRON
LUNA
GRANT
HIDALGO
NEW MEXICO
ARIZONA
GREEN-LEE
APACHE
GRAHAM
COCHISE
NAVAJO
GILA
SANTA CRUZ
PINAL
COCONINO
YAVAPAI
MARICOPA
PIMA
MOHAVE
YUMA

FIG. 1

TABLE I

OIL AND GAS FIELDS IN NORTHERN NEW MEXICO

*Key Letter**	*Field Name*	*Producing Formation*	*Age*	*Gas or Oil*
		SAN JUAN COUNTY		
A	Barker	Dakota	Cretaceous	Gas
A	Barker (deep)	Paradox	Pennsylvanian	Gas
B	Blanco	Farmington, Pictured Cliffs, Mesaverde	Cretaceous	Gas
C	Bloomfield	Farmington	Cretaceous	Oil
D	Fulcher Basin	Pictured Cliffs	Cretaceous	Gas
E	Hogback	Dakota	Cretaceous	Oil
F	Kutz Canyon	Pictured Cliffs	Cretaceous	Gas
G	Oswell	Farmington	Cretaceous	Oil
H	Rattlesnake	Dakota	Cretaceous	Oil
I	Table Mesa	Dakota	Cretaceous	Oil
J	Ute	Dakota	Cretaceous	Gas
		MCKINLEY COUNTY		
K	Hospah	Hospah	Cretaceous	Oil
L	Red Mountain	Mesaverde	Cretaceous	Oil
		HARDING COUNTY		
M	Bueyeros	Dockum	Triassic	CO_2 gas

* See Figure 1.

Prior to 1946 the Blanco gas field consisted of a single well, located in Sec. 29, T. 30 N., R. 9 W., which supplied gas to the town of Aztec. Gas is produced in this well from both the Pictured Cliffs and Mesaverde sandstones. In 1946 the Florance Drilling Company completed Goede No. 3, in the same section, as a small gas producer (176,000 cubic feet per day) from the Farmington sandstone, thus discovering a minor new pool. In August the same company completed Goede No. 4, also in Sec. 29, as a small producer from the Mesaverde, extending the gas reservoir in this formation $\frac{3}{4}$ mile north. All the accumulations at Blanco are of the stratigraphic-trap type.

TABLE II

DATA ON DEEP GAS WELLS, SOUTHERN UNION PRODUCTION COMPANY'S BARKER LEASE, SAN JUAN COUNTY

Well No.	*Location in T. 32 N., R. 14 W.*	*Ground Elevation (Feet)*	*Total Depth (Feet)*	*Pay Zones (Depth in Feet)*	*Initial Production, MCFGPD*	*Completion Date*
9	SE, SE, NW Sec. 21	6,237	9,466	8,420–98 8,620–50	42,000	May 3, '45
11	C, SE, NW Sec. 16	6,415	9,002	8,855–75	27,000	Sept. 21, '45
13	C, NW, NE Sec. 29	6,134	8,830	8,396–8,460	46,000	Mar. 2, '46
17	C, NW, NW Sec. 27	6,097	9,387	8,510–50	30,000	Nov. 26, '46

WILDCAT DRILLING

The wildcats completed in 1946 are shown in Table III. No logs are available on the two tests drilled in Arizona, which so far as known were located on non-technical evidence.

A deep test in McKinley County, Richfield's Drought No. 1, encountered pre-Cambrian at 7,140 feet. This test sheds interesting light on the thickness and distribution of Pennsylvanian rocks in the southeastern San Juan basin. It is situated between two other tests that reached the pre-Cambrian: Continental's L-Bar No. 1, about 18 miles southeast, and Plymouth's Santa Fe No. 1-A, some

TABLE III

WILDCATS COMPLETED IN ARIZONA AND NORTHERN NEW MEXICO IN 1946

*Key Number**	*County*	*Well*	*Location*	*Depth (Feet)*	*Formation at Total Depth*	*Date*	*Remarks*
			ARIZONA				
1	Coconino	B. Collins-Collins 1-X	36-34N-8E	1,959	Pennsylvanian	8/8	
2	Maricopa	J. A. Robertson-Robertson 2	33-5N-3W	4,970	Gila cong.	7/10	
			NORTHERN NEW MEXICO				
3	Colfax	Amer. Mfg. Co.-W. S. Ranch 1	1-26N-20E	3,814	Pre-Cambrian	5/23	Permian (?) on pre-Cambrian; thin pre-Triassic section
4	McKinley	Richfield-Drought 1	4-15N-6W	7,143	Pre-Cambrian	8/4	800 feet of Pennsylvanian on pre-Cambrian
5	McKinley	Ambrosia Investors-Fee 2	3-14N-10W	1,250	Dakota	June	Dakota test on Walker dome
6	Quay	Laughlin et al.-McFarland 1	2-13N-33E	264	Chinle	12/1	
7	Sandoval	F. B. Umbarger-Armijo 1	1-12N-3W	1,000	Morrison	1/5	Dakota test on Rio Puerco anticline
8	San Miguel	Hershfield et al.-Thompson 2	14-12N-22E	4,550	Pre-Cambrian	4/23	Flank test on Piño Mesa dome; 800 feet of Pennsylvanian (?) limestone, shale, and arkose on pre-Cambrian
9	San Miguel	Phillips-Leatherwood 1	2-15N-18E	2,773	Pre-Cambrian	11/14	Sangre de Cristo arkose on pre-Cambrian
10	San Miguel	A. B. Wharton-Upton 1	25-18N-26E	2,171	Sangre de Cristo	10/7	
11	Torrance	Dale Resler-Nalda 1	27-1N-15E	3,350	Pre-Cambrian	1/7	Red shale and arkose on pre-Cambrian
12	Valencia	C. S. Ringle-Fee 1	34-6N-4E	641	?	July	

* See Figure 1.

22 miles west. All three lie between the pre-Cambrian mass of the Zuni Mountains on the southwest and that of the Nacimiento Mountains on the northeast. Whereas the L-Bar No. 1 encountered more than 1,400 feet of Pennsylvanian shale and limestone above the crystalline rocks, the Drought No. 1 penetrated only 800 feet and the Santa Fe No. 1-A only about 300 feet. An isopach map constructed on these thicknesses shows a depositional trough, deep toward the southeast, with its axis passing near the L-Bar No. 1 and between the other two tests. The trend of this trough, N. 65° W., is roughly parallel with the line of strike of the pre-Cambrian surface as determined from the three tests, and with the strike of the pre-Cambrian core of the Zuni Mountains. It is undoubtedly through this deep trough that the Pennsylvanian seas of the San Juan basin connected with those of central New Mexico.

TRENDS

The San Juan basin continued to be by far the most active part of the region. Establishment of new district offices by major oil companies brought the total of these offices to four in Albuquerque and two in Durango, Colorado. Fifteen major companies had geophysical parties in the basin. At the end of the year interest was centering on two wildcats drilling to test Dakota possibilities at depths greater than previously reached. These were Byrd-Frost and P. B. English's Hargrave No. 1 in Sec. 4, T. 27 N., R. 10 W., and Petroleum Products' Santa Fe No. 1 in Sec. 21, T. 21 N., R. 8 W., both in San Juan County. The intensity of interest and activity in the San Juan basin gave no indication of abating at the end of 1946.

Renewed drilling in the Bueyeros carbon-dioxide field of central Harding County was under way at the end of the year. This followed the abandonment late in 1945 of the Estancia Valley field, Torrance County, by the Witt Ice and Gas Company.

Additional drilling in Cochise County, Arizona, was reportedly about to be undertaken late in the year. A wildcat in eastern Grant County, New Mexico, was receiving attention.

STRATIGRAPHY

In the publications listed at the end of this paper, of which a large proportion are maps of the U. S. Geological Survey's oil and gas series, a profusion of new geologic names appeared. Most of these were applied to members of already established formations; but a few new formations were also named. The stratigraphic terms introduced in 1946 are listed. (The number in parentheses refers to the entry in the selected bibliography that follows.)

TERTIARY

Baca formation. Type section: northern Bear Mountains, Socorro County, where it is 694 feet thick; in Joyita Hills, consists of coarse conglomerate, red and white sandstone, and red clay, 80–140 feet thick; is a basin deposit truncating all Cretaceous formations, and may be equivalent in age to Galisteo formation. Named by Wilpolt and others (12)

LOWER CRETACEOUS

Pajarito shale member and Mesa Rica sandstone member of Purgatoire formation; northwestern Quay County. Named by Dobrovolny and Summerson (4)

TRIASSIC

Correo sandstone member of Chinle formation; Valencia and Socorro counties. Named by Kelley and Wood (7)

Redonda member of Chinle formation; northwestern Quay County. Named by Dobrovolny and Summerson (4)

Salitral shale tongue and Agua Zarca sandstone member of Chinle formation; Sandoval and Rio Arriba counties. Named by Northrop and Wood (9)

PERMIAN

Los Vallos member of Yeso formation; Valencia and Socorro counties. Named by Kelley and Wood (7)

San Ysidro and Meseta Blanca sandstone members of Yeso formation; Sandoval and Rio Arriba counties. Named by Northrop and Wood (9)

Torres member of Yeso formation; Socorro and Torrance counties. Named by Wilpolt and others (12)

Aqua Torres formation. Type section: southeastern Los Pinos Mountains, Socorro County, where it consists of "a thin conglomerate at the base above which lies a sequence of arkoses, red sandstones, red shales, and nodular limestones, and at the top a gray, massive limestone." Lies between gray limestones of Virgil age and continental redbeds of Abo formation; Wolfcamp in age, which authors consider Permian. Named by Stark and Dapples (10)

PERMIAN (?)

Bursum formation. Type section: west foothills of Oscura Mountains, Socorro County. In Joyita Hills, Los Pinos Mountains, and Abo Canyon, consists of "dark purplish red and green shale in beds up to 40 feet thick, separated by thinner beds of arkose, arkosic conglomerate, and gray limestone." Lies between gray Madera limestone (Pennsylvanian) and continental Abo redbeds. As shown by fusulinids, is Wolfcamp in age, which authors regard as Permian (?). Named by Wilpolt and others (12)

PENNSYLVANIAN

Red Tanks member of Madera limestone. Type section: tributaries of Red Tanks Arroyo, west side of Ladron Mountains, Socorro County. Lower part consists of dark red-brown siltstone, sandstone, and shale; upper part, of gray thin-bedded marine limestone and gray shale. Locally "the base contains buff sandstone and limestone conglomerate." Member is underlain by massive limestone of Atrasado member of Madera limestone. "There is some intertonguing of the marine sediments of the Red Tanks member with the continental beds of the overlying Abo formation." Member is placed in Madera limestone of Magdalena group, which authors regard as Pennsylvanian in age. Named by Kelley and Wood (7)

Atrasado and Gray Mesa members of Madera limestone; Valencia and Socorro counties. Named by Kelley and Wood (7)

For several years prior to 1946 it had been known that an unnamed interval of transitional beds occurred in central New Mexico between gray limestones of late Pennsylvanian age and continental redbeds of the Abo formation. In 1946 this interval received no less than three names—Aqua Torres formation, Bursum formation, and Red Tanks member of the Madera limestone—and was assigned to three different ages, respectively Permian, Permian (?), and Pennsylvanian. The term Red Tanks member has priority, but it is doubtful if the unit in question will remain at the nomenclatural level of a member. Further work, regional and extensive rather than local and intensive, is obviously needed, not only to straighten out this matter but also to integrate the many other stratigraphic terms now being newly applied.

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DEVELOPMENTS IN NORTH AND WEST-CENTRAL TEXAS IN 1946[1]

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Wichita Falls and Abilene, Texas

ABSTRACT

In 1946, the north and west-central Texas district contributed 102 discoveries, including 21 outposts, 2 shallower-pool tests, 4 deeper-pool tests, 1 field-development well providing a discovery, 28 new-pool wildcats, and 45 new-field wildcats. This is comparable with a total of 125 discoveries in 1945.

In 1946, 3,007 wells were drilled, of which 653 were exploratory. Compared with the 1945 record of 2,240 wells drilled, including 468 wildcats, there was an increase in drilling activity of 26 per cent.

In all, 57,840,000 barrels of oil were produced in north and west-central Texas during 1946, compared with 54,283,000 in 1945, an increase of 3,557,000 barrels. The production of 11,946,000 barrels of oil from Wichita County continued it as the leading producing county of the district.

The more important developments in the district in 1946 were: (1) the discovery of the Manning-O'Connor, "Caddo" limestone, field in southwestern Stephens County; (2) the discovery of several fields in Throckmorton County through the use of the reflection seismograph; (3) the discovery of Strawn production in east-central Haskell County ; (4) the discovery of the Eskota field, southeastern Fisher County, producing from a Canyon reef; and (5) the general shift of explorational activity to that part of the district west of the axis of the Bend arch.

Of the 102 discoveries and extensions made in 1946, there were: 8 from the Ordovician, 4 from the Mississippian, 23 from the Bends, 28 from the Strawn, 9 from the Canyon, 29 from the Cisco, and 1 from the Cretaceous.

The use of subsurface geology and the reflection seismograph proved most effectual in the discovery of oil in this district.

INTRODUCTION

The north and west-central Texas district consists of 50 counties which contain an area of approximately 45,000 square miles. This area extends from the Llano uplift on the south to the Red River on the north and from the east flank of the Midland basin on the west to include the Marietta-Sherman basin on the east.

The principal structural features of the area are the Bend arch, the Red River uplift, the Muenster arch, and the Marietta-Sherman, Fort Worth, Hardeman, and Baylor basins. The Bend arch extends northward from the Llano uplift to Wichita County. The Red River uplift extends east and west across the area west of Petrolia in Clay County. This uplift separates the Hardeman basin on the north from the Baylor basin on the south in the area west of the Bend arch. The Muenster arch, a southeast continuation of the Amarillo-Wichita uplift, separates the Fort Worth basin, adjoining the Bend arch on the east, from the Marietta-Sherman basin.

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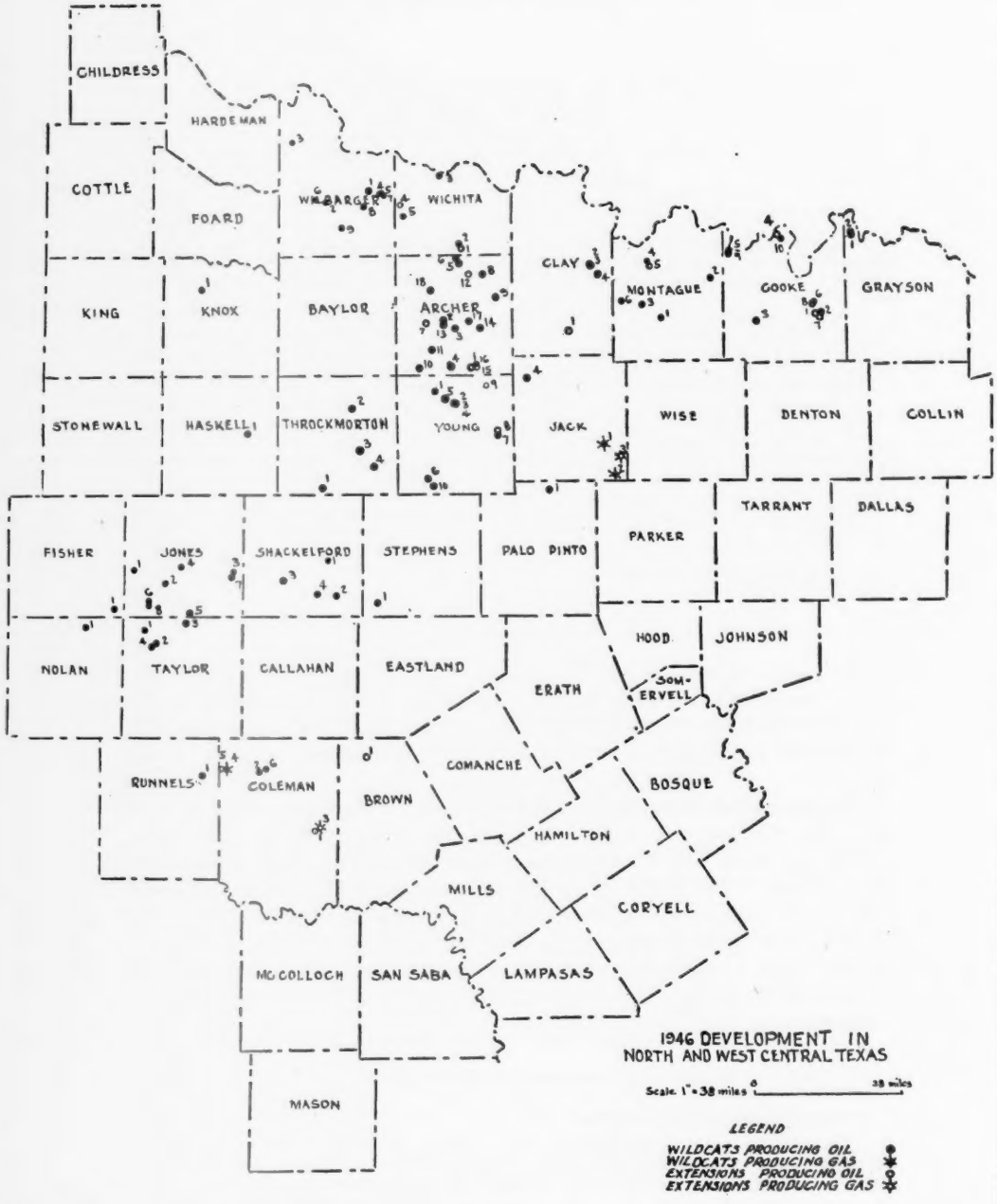

CHILDRESS
HARDEMAN
COTTLE
FOARD
WILBARGER
WICHITA
CLAY
MONTAGUE
GOOKE
GRAYSON
KING
KNOX
BAYLOR
ARCHER
STONEWALL
HASKELL
THROCKMORTON
YOUNG
JACK
WISE
DENTON
COLLIN
FISHER
JONES
SHACKELFORD
STEPHENS
PALO PINTO
PARKER
TARRANT
DALLAS
NOLAN
TAYLOR
CALLAHAN
EASTLAND
ERATH
HOOD
JOHNSON
SOMERVELL
RUNNELS
COLEMAN
BROWN
COMANCHE
BOSQUE
HAMILTON
MILLS
CORYELL
MCCOLLOCH
SAN SABA
LAMPASAS
MASON
1946 DEVELOPMENT IN
NORTH AND WEST CENTRAL TEXAS
Scale. 1"=38 miles
0
38 miles
LEGEND
WILDCATS PRODUCING OIL
WILDCATS PRODUCING GAS
EXTENSIONS PRODUCING OIL
EXTENSIONS PRODUCING GAS

FIG. 1

DEVELOPMENT

Development in north and west-central Texas continued the trend of the previous several years, that of increased activity. There were drilled in 1946, 3,007 wells compared with 2,240 in 1945, an increase of 26 per cent in drilling activity. Of the 3,007 wells drilled, 1,469 were completed as producers and 1,538 as dry holes. There were 653 exploratory tests drilled during the year as compared with 468 in 1945, with the resulting discovery of 101 new fields, pools, and extensions as compared with the discovery total of 125 in 1945.

Altogether 57,940,000 barrels of oil were produced in this area during 1946. Compared with a total recovery of 54,283,000 in 1945, there was an increase of 3,557,000 barrels, or 6.55 per cent, during 1946.

The new fields, the new producing formations in old fields, and the extensions discovered during 1946, are indicated in Figure 1 and Table I. The "Class" of discovery is given according to the classification of exploratory wells as described by F. H. Lahee.[4] The more important discoveries and developments during the year in this area are as follows.

1. The major discovery for the west-central Texas area during 1946 seems to be the Manning-O'Connor field in southwestern Stephens County. This field, producing from the Bend "Caddo" limestone, completed 23 wells during the year, of which 17 were oil wells, 3 gas wells, and 3 dry holes. Approximately 700 acres have been proved and the limits of the field have been defined in all directions except south.

2. The discovery of several fields in Throckmorton County through the use of the reflection seismograph has been an important development through the year. These fields were discovered with a minimum drilling of dry holes, and indicated the most successful method of exploration for this county, and probably for the area.

3. A new field opened in east-central Haskell County, producing from the Strawn limestone, may be developed into one of marked importance.

4. The Skelly Oil Company's Huddleston No. 1-A, Eskota field discovery in southeastern Fisher County, produced oil from a Canyon reef. Subsequent drilling has not developed the pool materially, but the area may be developed profitably.

5. The completion of the Phillips Petroleum Company's Pan Ace producer from the Ellenburger limestone in Shackelford County gave hopes of a bright future for the Ellenburger limestone in this area. Subsequent development has been disappointing.

6. Ellenburger production from a depth of 5,248–5,268 feet in the W. H. Hammon and Warren Petroleum Company's Parker No. 1, west of Wichita Falls, gives considerable encouragement for Ellenburger exploration.

7. Basal Pennsylvanian conglomerate production in Knox County in 1946,

[4] F. H. Lahee, "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), p. 630.

TABLE I

New Pools and Extensions Discovered in 1946

Map Index	County	Field	Operator	Farm, Well No.	Location	Class	Producing Formation	Depth of Prod. Fm. (Feet)	Total Depth (Feet)	Daily Initial Prod. (Barrels)	Method of Explor.
1	Archer	Burns-Benson	Burns	Andrews 3	W. Lockhart A-264	Out	Bend ls.	4,474–4,504	4,627	—	Sub., Seis.
2			Cochran & Cain	Seay 2	69, HSCR	NPW	Cisco	1,148–1,156	1,159	10	Trend
3			Dawson & Barnes	Abercrombie 1	152, HSCR	NPW	Cisco	1,060–1,066	1,069	20	Trend
4			Dublin	Campbell 2	BBB&C A-36	NPW	Cisco	1,064–1,065	1,065	9	Sub.
5		E. Holliday	Fain & McGaha	Perkins 1-D	27, 3, Denton CSL	DP	Strawn	–4,161	4,512	86	Seis.
6		E. Holliday	Fain & McGaha	Perkins 1-E	15, 3, Denton CSL	NPW	Strawn	4,074–4,084	4,084	180	Sub.
7		Llewellyn	Fortex	Ray 1	W. C. Winters	Out	Cisco	1,450–1,455	1,490	30	Sub.
8			Gibson	McCrory 2-A	1, 55, ATNCL	NPW	Cisco	1,459–1,467	1,467	50	Trend
9			Grace	Edwards 1	16, G. D. Bruner, A-8	NFW	Bend ls.	5,495–5,500	5,741	35	Trend
10			Grace	Russell 1	7, Crawford Sub. 1 Holman	NPW	Cisco	1,290–1,292	1,292	9	Trend
11			Harvey	Abercrombie 1-A	F. M. Taber A-723	NPW	Cisco	1,274–1,279	1,279	10	Trend
12		Hull-Silk-Sikes	Republic N. G.	Nichols 1	30, 1, ATNCL	Out	Strawn	4,385–4,405	4,405	200	Sub.
13			Smiley-Norwood	Harris 1	71, HSCR	NPW	Cisco	1,122–1,126	1,135	45	Sub.
14			Smith	Carpenter 1	89, 4, Clark & Plumb	NPW	Cisco	1,064–1,066	1,066	6	Trend
15		Burns-Benson	Snowden	Morrison 1	1,823, TE&L	Out	Bend ls.	4,605–4,615	5,236	206	Trend
16		Burns-Benson	Snowden	Morrison 2	1,823, TE&L	NPW	Strawn	4,316–4,340	4,340	218	Sub.
17			Staley	Powell 2	J. M. Armstrong A-763	NPW	Cisco	938– 942	942	10	Sub.
18			Young	Wilson 1	1, BBB&C A-39	NPW	Cisco	1,501–1,503	1,503	27	Trend
1	Brown		Kleiner & Heltzel	Fomby 1	W. B. Smith A-155	Out	Ellenburger	3,132–3,151	3,151	38	Sub.
1	Clay	Heard-Caddo	Burns	Ford 1	3,221, TE&L	Out	Bend ls.	5,751–5,761	6,701	560	Sub., Seis.
2		E. Henrietta	Grace	Edwards 1-B	S. C. Beldon A-12	NFW	Strawn	5,484–5,503	5,503	—	Non-tech.
3		E. Henrietta	Grace	Edwards 1-C	S. C. Beldon A-12	Out	Bend cong.	6,070–6,088	6,088	1,800	Trend
4			Lipscomb	Hapgood 1-A	78, Marion CSL A-308	NFW	Strawn	4,975–5,002	5,002	127	Seis.
1	Coleman	Moore	Coleman	Moore 1	496, Wharton CSL	Out	Canyon	–1,475	1,475	77	Sub.
2		Gunn East	Fulwiler & Hughes	Templeton 1	8, 1, HT&B	NPW	Strawn	3,457–3,487	3,487	1,130	Sub.
3			Lone Star	Wallace 1	751, Martinez	Out	Canyon	–2,127	2,134	Gas	Sub.
4			Owens & Rhodes	Gorman 1	31, 2, T&NO	NFW	Strawn	–3,722	3,728	Gas	Sub.
5			Owens et al.	McCain 2	14, SPRR	Out	Strawn	–3,724	3,728	25	Sub.
6		Gunn East	Stewart	Burroughs 1	4, 1, HT&B	NPW	Strawn	3,146–3,147	3,483	55	Sub.
1	Cooke	Wilson	Anderson	Holcomb 1	ACC Bailey A-44	Out	Strawn	4,089–4,093	4,302	29	Sub.
2		Wilson	Burk Roy.	Bentley 1	ACC Bailey A-44	NPW	Strawn	2,194–2,205	2,233	27	Sub.
3			Hollandsworth	King 1	M. Langham	NPW	Strawn	1,005–1,010	1,010	10	Trend
4		Sivells Bend	Mid-Cont.	Mabel Field 1	F. Wilkerson	Out	Strawn	6,796–6,820 6,839–6,848	7,500	142	Sub.
5		Grant-Modesset	Modesset	Dennis 1	H. Henderson A-444	NPW	Strawn	1,820–1,830	2,111	150	Sub.
6		Almon	Seitz	Davis 1	T. Rutledge A-868	Out	Strawn	2,359–2,370	4,138	60	Sub.
7		Wilson	Seitz	Mooney 2	ACC Bailey A-44	Out	Strawn	2,173–2,180	2,180	131	Sub.
8		Almon	Snuggs et al.	Almon-Sun 7	J. M. Randolph	Field Devel. Well, opened NP	Strawn	3,935–3,942	3,942	120	Sub.
9		Grant-Modesset	Snuggs & Neal	Dennis 1	H. Henderson A-444	NPW	Strawn	2,168–2,174	2,174	115	Trend
10		Sivells Bend	Std. of Texas	Beasley 2	J. McKerley A-639	DP	Ellenburger	8,905–8,940	9,164	166	Sub., Seis., Grav.

Note: Out, outpost; SP, shallower-pool test; DP, deeper-pool test; NPW, new-pool wildcat; NFW, new-field wildcat.

1	Fisher	Eskota	Skelly	Huddleston 1-A	11, 19, T&PRR	NFW	Canyon	4,325–4,400	4,405	804	Coredrill, magnet.
1	Grayson	Handy	Texas	Handy 2	S. Stewart A-1,069	NFW	Strawn	1,665–1,698	1,699	509	Sub.
2		Handy	Texas	Handy 3	S. Stewart A-1,069	Out	Cretaceous	398– 402	1,286	500 M. gas	Sub.
1	Haskell	Chapman	Humphrey	Chapman 1	Tidwell A-60	NFW	Strawn	4,070–4,082	5,470	469	Sub.
1	Jack		Continental	Cherryholmes 1-C	Florida Payne A-1564	NFW	Bend cong.	4,572–4,590	5,626	176 M. gas	Seis.
2			Continental	Heath 1	C. A. Beaty	NPW	Bend cong.	4,432–4,442	6,225	1,070 M. gas	Seis.
3		Risch	Continental	Workman 1	54, 1, Henderson CSL	Out	Bend cong.	4,882–4,900	5,106	2,830 M. gas	Sub.
4		Hoefle	Hanlon & Buchanan	Moore 1-B	BBB&C A-1367	DP	Ellenburger	–6,003	6,003	15	Sub., Seis.
1	Jones	Minter	Autry	Minter 1	39, 2, SPRR	NFW	Cisco	3,436–3,450	3,650	250	Sub.
2			Delta	Grove 1	J. W. McKissick A-204	NFW	Cisco	2,680–2,682	2,682	132	Sub., Coredrill
3			Elliott	Roberts 1	J. Gasner 8	NFW	Cisco	1,640–1,651	1,652	16	Sub.
4		Propst	Fitzgerald	Propst 1	10, 1, T&NO	NFW	Cisco	–2,703	3,003	10	Electric
5		Winter	Hart	Morrison 1	D. Bruce A-135	NFW	Cisco	2,173–2,183	2,186	91	Sub.
6			Roark	Cade 1	4, DeWitt CSL A-150	NFW	Cisco	2,996–3,013	4,603	92	Coredrill
7			Roark	Hodges 1	A. Bell, A-6	NFW	Cisco	1,940–1,944	1,944	25	Sub., Trend
8		Pitzer	Roark	Pitzer 1	25, DeWitt CSL A-150	NFW	Strawn	4,439–4,452	5,321	115	Coredrill
1	Knox	Truscott	Cities Service	Mulkey 1	163, 14, H&TC	NFW	Basal Penn. cong.	6,225–6,247	6,785	10	Sub., Seis.
1	Montague	Lewis	Continental	Lewis 1-B	N. S. Ussery	NFW	Bend cong.	6,348–6,356	6,455	119/3 hrs.	Seis.
2		Bowers	Eason	Yarbrough 1	F. J. Bellows A-33	NPW	Strawn	4,115–4,118	4,118	328	Trend:
3		Hildreth	Hays Robertson	Henry 1	N. Kimbro A-405	NPW	Bend cong.	5,892–5,922	6,170	209/6 hrs.	Sub., Seis.
4		N. Belcherville	Johnson	Crenshaw 1	W. Wallace	NFW	Bend cong.	5,550–5,565	5,719	75	Sub., Seis.
5		Belcherville	Magnolia	Sudie Stowe 1	Peter Miller	Out	Bend cong.	5,362–5,382	5,657	129	Sub.
6		Caudle	Youngblood & Foree	Benton 2	A. A. Lewis A-420	NFW	Bend cong.	6,132–6,142	6,243	3,132	Sub., Seis.
1	Nolan	Faver	Sohio	Faver 1	50, 21, T&P	NFW	Strawn	–5,684	5,836	10	Sub.
1	Palo Pinto	Ashland Ellenburger	Ashland	Lee 1 A	1,744, TE&L	NFW	Ellenburger	–5,046	5,046	73	Sub., Seis.
1	Runnels		Ransome	Harris 1-A	J. V. Cabrera A-514	NFW	Strawn	3,900–3,920	4,085	59	Sub.
1	Shackelford	Sanders Ellenburger	Allied	Sanders 1	583, TE&L	NFW	Ellenburger	4,535–4,540	4,540	543	Sub., Seis.
2		Pan Ace	Phillips	Pan Ace 1	16, LAL	NFW	Ellenburger	4,210–4,220	4,220	1,420	Seis.
3			Roeser-Pendleton	Lee 1	27, 11, T&P	NFW	Caddo	4,465–4,474	4,878	7	Sub., Seis.
4			Street & Bessmer	Green 1	49, 12, T&P	NFW	Cisco	1,203–1,206	1,206	35	Sub.
1	Stephens	Manning O'Connor	Manning	O'Connor 1	52, 7, T&P	NFW	Caddo	3,396–3,403	3,403	528	Sub., Seis.
1	Taylor		Hovgard	Campbell 1	6, 18, T&P	NFW	Cisco	–2,508	3,202	6	Sub.
2			West Central Drlg. Co.	Ingram 1	18, Grimes CSL A-146	NFW	Cisco	2,740–2,742	3,110	53	Coredrill, Sub.
3		Kincaid	West Central Drlg. Co.	Kincaid 1	27, 16, T&P	NFW	Cisco	2,613–2,621	2,710	138	Sub.
4		Ingram West	West Central Drlg. Co.	Murphree 1	1, 9, SPRR	NFW	Cisco	2,626–2,629	3,062	124	Coredrill
1	Throckmorton		Dillard	Matthews 1	235, ETRR	NFW	Cisco	–1,066	1,066	25	Sub., Sur.
2			Sztykgold	Richardson 1	3083, TE&L	NFW	Caddo	–4,650	5,151	920	Seis.
3			Manning	McKnight 1-D	2, DL&C	NFW	Caddo	–4,100	5,056	14	Seis.
4		Parrott East	Manning	Atkinson 1	961, TE&L	NFW	Caddo	–3,903	3,905	508	Seis.
1	Wichita	Taylors Corner	Consolidated	Wade 2	6, 2, Denton CSL	SP	Cisco	1,207–1,328	1,328	62	Sub.
2		Taylors Corner	Hammon & Warren	Parker 1	26, Palo Pinto CSL	DP	Ellenburger	5,248–5,268	5,268	168	Sub., Trend.

TABLE I—(*Continued*)

Map Index	*County*	*Field*	*Operator*	*Farm, Well No.*	*Location*	*Class*	*Producing Formation*	*Depth of Prod. Fm. (Feet)*	*Total Depth (Feet)*	*Daily Initial Prod. (Barrels)*	*Method of Explor.*
3			Texas	Foster 2	S. Denison A-64	NPW	Cisco	1,885–1,895	3,200	24	Sub.
4		Electra	Wood	Waggoner 1	147, H&TC A-122	Out	Cisco	1,987–1,998	2,016	15	Sub.
5		Electra	Wood	Waggoner 1-C	Seals & Morris A-393	NPW	Cisco	1,438–1,447	2,025	30	Sub.
1	Wilbarger	Harrold Strawn	Big Six	Schlaffke Morris 1-A	3, 14, H&TC	DP	Strawn	4,230–4,236	5,146	516	Sub.
2		Rock Crossing	Lawson & Anderson-Prichard	Baker 2	85, 14, H&TC	NPW	Canyon	3,270–3,310	3,310	93	Trend.
3		Tolbert	Nat. Assoc.	Crouch 1	24, 16, H&TC	NFW	Canyon	5,015–5,039	5,612	129	Seis.
4		National	Nat. Assoc.	Kelly 4-A	30, 13, H&TC	NPW	Bend ls.	4,454–4,478	4,925	160	Seis.
5		National	Nat. Assoc.	Kelly 5-B	36, 13, H&TC	NPW	Strawn	4,306–4,318	4,895	456	Seis.
6		National Victory	Nat. Assoc.	Schmoker 1	111, 14, H&TC	NFW	Canyon	3,502–3,527	5,718	132/9 hrs.	Seis.
7		National	Nat. Assoc.	Smith 1	30, 13, H&TC	NPW	Canyon	3,663–3,675	3,675	240	Seis.
8			Paradise	Waggoner I-1	11, 14, H&TC	NFW	Canyon	3,139–3,155	4,964	480	Seis.
9		Waggoner-Ellenburger	Waggoner	Waggoner QQ-1	39, 2, H&TC	NFW	Ellenburger	4,502–4,516	4,562	504	Trend, Seis.
1	Young		Burns	Dunagan 1	170, TE&L	NPW	Mississ.	5,048–5,064	5,240	2,000	Seis.
2		Davis	Burns	Ellis 1	207, TE&L	Out	Mississ.	4,848–4,865	4,865	480	Seis.
3			Burns	Ellis 2	207, TE&L	SP	Cisco	764– 772	772	9	Sub.
4		Davis	Davis	Baldwin-Lovett 1	207, TE&L	NFW	Mississ.	4,844–4,859	4,865	476	Sub.
5			Dillard	Killian 1	211, TE&L	NFW	Mississ.	4,944–4,960	4,965	280	Sub.–
6		Kendall	Hanlon-Buchanan	Kendall 1	4, BS&F, A-1,722	NFW	Bend ls.	3,466–3,481	3,481	316	Sub., Seis.
7		Logan	Hanlon-Buchanan & Rankin	Logan 1	3, J. Poitevent A-228	NFW	Bend ls.	4,002–4,009	4,014	81	Sub., Seis.
8		Logan	Hanlon-Buchanan	Smith 1	E. L. Douglas A-2,157	Out	Bend ls.	4,037–4,046	4,046	51	Sub., Seis.
9		Garvey	LeSage	Garvey 2	A. B. Jamison A-1,686	Out	Strawn	3,640–3,648	3,648	12	Sub.
10			NuEnamel	Donnell 1	1,205 TE&L	NFW	Canyon	1,759–1,780	3,402	31	Seis.

was the first production in this county. The well is non-commercial, and its geological importance may need to be evaluated later.

8. Shallow discoveries were made by subsurface mapping. This was supplemented in part by information from core drilling.

9. The most significant development noted in exploratory effort was that the western part of the north and west-central Texas area was receiving the increased attention of operators.

Of the 102 discoveries and extensions made in 1946, there were 8 from the Ordovician, 4 from the Mississippian, 23 from the Bend, 28 from the Strawn, 9 from the Canyon, 29 from the Cisco, and 1 from the Cretaceous. The rate of discovery from each of the formations shows little change from the previous year except that the Mississippian beds yielded only one-third as many discoveries as in the preceding year.

The discovery methods responsible for the new production are as follows: 0, surface geology alone; 43, subsurface geology; 18, reflection seismograph; 14, trend, which includes some random drilling and lease obligations; 3, core drill; 1, electric; 1, random drilling; and 22, a combination of two or more methods. Seismograph and subsurface mapping has been the most effective combination of the methods employed.

The following tabulation gives the type and number of geophysical surveys and core drilling in this area.

Date 1946	*Seismograph*	*Gravity*	*Magnetometer*	*Core Drill*	*Electric Resistivity*
Jan. 1	12	5	1	2	1
July 1	19	6		2	0
Dec. 30	25	5	1	4	0

The success obtained through the use of the reflection seismograph accounts for its increased use. Practically all of this increase in the use of geophysical services was in the west-central Texas part of the district.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 31, NO. 6 (JUNE, 1947), PP. 1052-1058, 1 FIG.

DEVELOPMENTS IN SOUTH TEXAS IN 1946[1]

BRUCE SCRAFFORD[2]
San Antonio, Texas

ABSTRACT

The rate of development in the South Texas district during 1946 surpassed that of previous years. The increased rate of development in proved areas resulted from the election by operators to revert from density patterns established by the Petroleum Administration for War to density patterns set out by the Railroad Commission of Texas for each field. There was a decline in the rate of wildcat developments in 1946 as well as a decrease in the rate of new field discoveries. The new fields discovered do not appear to be of major reserve importance or equal in potential reserves to the annual production of the district. The 15,384 oil wells in the South Texas district produced 137,934,170 barrels of oil, approximately 5 per cent of the world production, 8 per cent of the United States production, or 18 per cent of the annual oil production of Texas. The 1,085 gas wells tendered to gas transmission lines 510,399,785 MCF of gas during the year. Over 54 per cent of all development in South Texas was located in the Frio-Vicksburg trend which is supplying 76 per cent of the production of the district.

INTRODUCTION

The South Texas district, embracing the 59 counties shown in Figure 1, is the area referred to by the Railroad Commission of Texas Oil and Gas Division as districts 1, 2, and 4.

For convenience, because of the large size of the South Texas district, development in this area has been subdivided into stratigraphic divisions based on the geologic age of the various production trends. These subdivisions, previously suggested by Kidd, are as follows:[3] (1) the Ordovician and Pennsylvanian of the Edwards Plateau; (2) the Cretaceous of the Balcones Fault zone; (3) the Wilcox, Carrizo, Queen City, and Sparta of the lower Eocene trend; (4) the Yegua and Jackson of the upper Eocene; (5) the Frio-Vicksburg group of the basal Oligocene; and (6) the upper Oligocene and lower Miocene of the coastal area, including the *Marginulina*-Frio, Catahoula, and Oakville.

DEVELOPMENT

During the year 1946, 1,748 wells of all categories were drilled in the South Texas district, an increase of 130 over 1945. The increase was found to occur in the development of proved areas where operators elected to revert from the well-density patterns established under the supervision of the Petroleum Administration for War to the density pattern as set out for each area by the Railroad Commission of Texas. Of the 1,343 wells drilled in proved areas, 77 were dually completed. Of the total wells drilled as field wells, 81 per cent were successfully

[1] Manuscript received, March 29, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Consulting geologist, 1610 Alamo National Bank Building. Assistance of the following in checking the accuracy of development data is hereby acknowledged: W. W. Hammond and others of the Magnolia Petroleum Company; C. H. Row, H. M. Hansell, and L. C. Smith of the Sun Oil Company; and Jack K. Baumel and Sol Smith of the Railroad Commission of Texas.

[3] Gentry Kidd, "Developments in South Texas, 1938–1939," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 23, No. 6 (June, 1939), pp. 86c–70.

completed as producers, and 256 tests were abandoned. Eighty-five per cent of the producers were completed as oil producers and the remaining 15 per cent as gas or gas-condensate wells.

Three hundred eighty-one wildcat and 37 semi-wildcat wells were drilled in the South Texas district during 1946. One well, the discovery well of the Poehler field in Goliad County, was dually completed as an oil and gas-condensate producer from reservoirs of the Wilcox formation. Not only were fewer exploratory tests projected during this year than during 1945, as well as a decreased percentage of successful tests, but also the reserve importance of the discoveries resulting from wildcat development declined. The general character of the 1946 discoveries does not indicate ultimate reserves of these new fields will equal the production from the district for the year. The location of discoveries, fields extended, and fields in which new producing formations have been encountered, are shown on Figure 1. Table I lists the fields discovered during 1946. Eight and seven-tenths of every 100 wildcat wells drilled during 1946 were completed as producers as compared with 10.6 successful for each 100 drilled during 1945.

PRODUCTION

At the close of the year, 15,384 oil wells in the South Texas district were accounting for 4.94 per cent of the daily production of the world with a daily annual average production of 377,897 barrels. During the year, 137,934,170 barrels of oil were produced, 5,011,170 barrels more than in 1945. Of the 15,384 oil wells in the fields of this area, 59 per cent are producing by natural flow and the remaining 41 per cent are producing by various means of artificial lift.

The 1,085 gas wells in this area produced during the year 510,399,785 MCF of gas. Of the amount of more than ½ trillion cubic feet produced, 120,778,576 MCF of gas was tendered to transmission lines. The remainder of the gas was processed for recovery of liquid hydrocarbons and the residue returned to the formation or was used for pressure maintenance, gas-lift purpose, *et cetera*. Less than 0.1 per cent of the gas-well gas was reported to have been lost by venting. An additional 8,334,723 MCF of gas was serviced to the transmission lines from casinghead gas production.

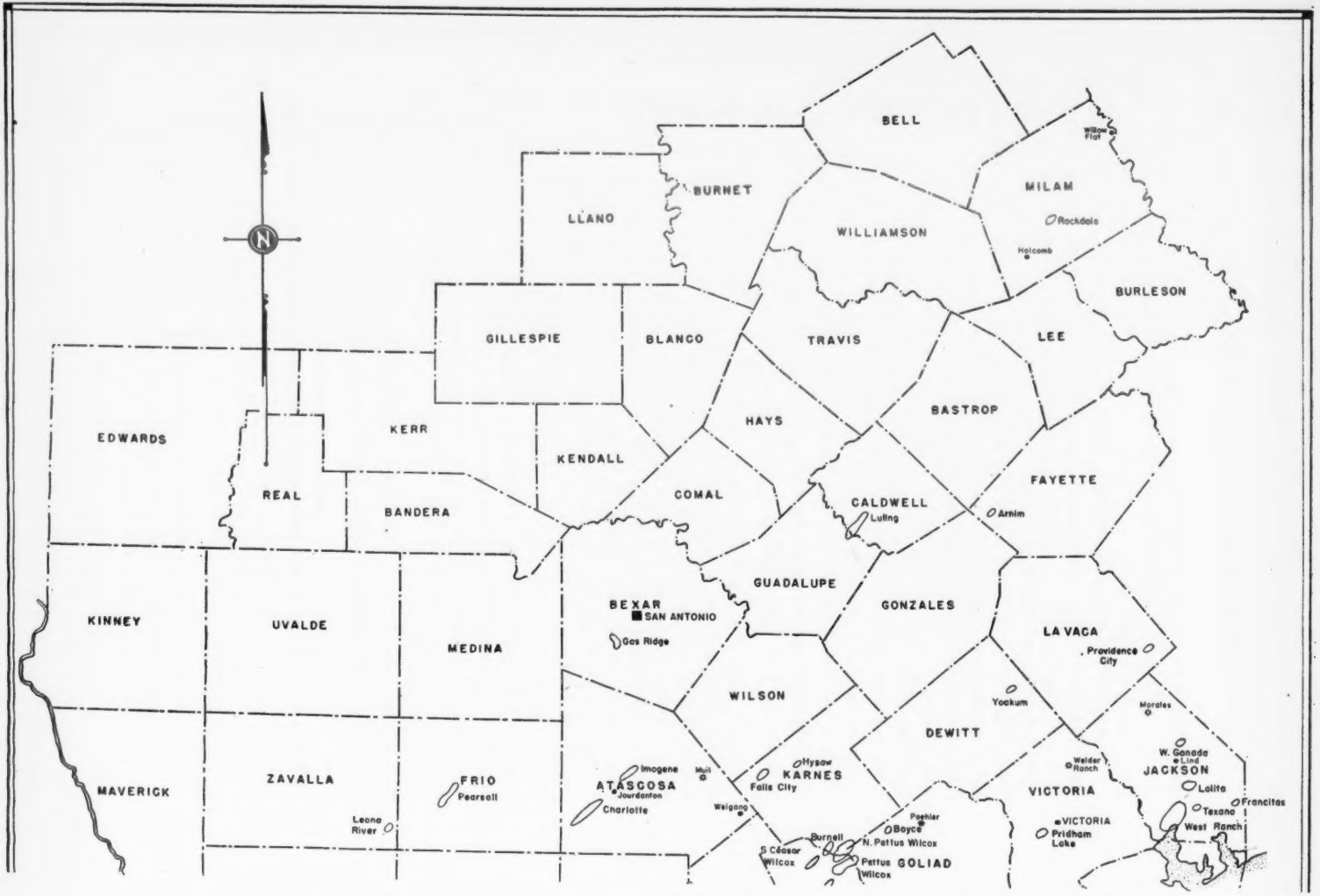
Gas transmission lines, now under construction in the Lower Rio Grande Valley, will make available needed outlets for the gas reserves of this area.

EDWARDS PLATEAU

Eight exploratory tests were drilled in the area of the stratigraphical subdivision known as the Edwards Plateau. All 8 tests were non-productive and abandoned. There is at present no commercial oil production from reservoirs of pre-Cretaceous age in the South Texas district.

CRETACEOUS FAULT LINE

Eighty-five wildcats and 86 field wells, 10 per cent of the total wells drilled in the South Texas area in 1946, were drilled in the Cretaceous fault-line trend.


BELL
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LLANO
WILLIAMSON
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Rockdale
Holcomb
BURLESON
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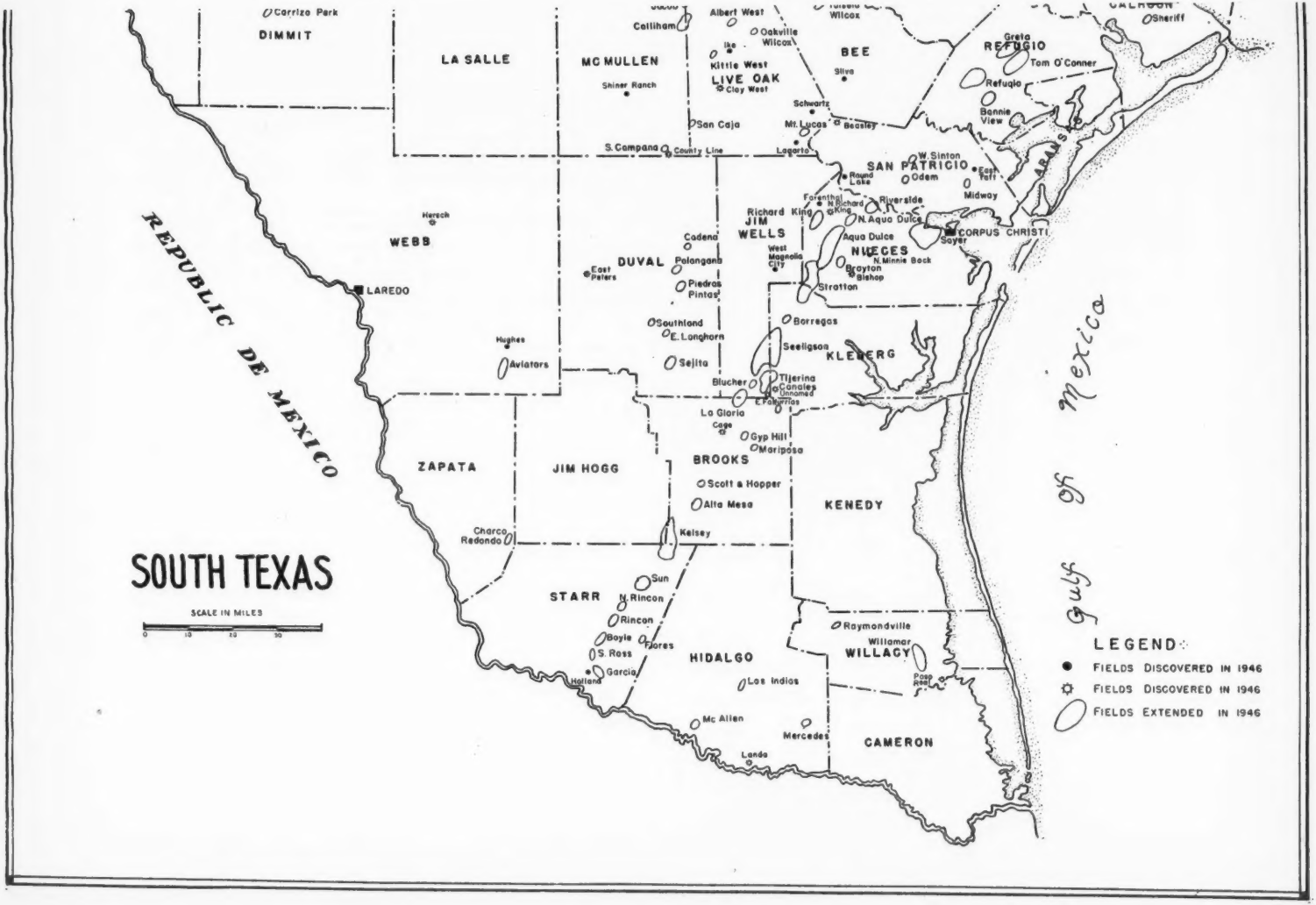
EDWARDS
KERR
KENDALL
HAYS
BASTROP
REAL
BANDERA
COMAL
CALDWELL
Luling
Arnim
FAYETTE
GUADALUPE
GONZALES
KINNEY
UVALDE
MEDINA
BEXAR
SAN ANTONIO
Gas Ridge
LA VACA
Providence City
WILSON
Yoakum
Morales
DEWITT
MAVERICK
ZAVALLA
FRIO
Pearsall
Leona River
Imogene
Mull
ATASCOSA
Jourdanton
Charlotte
Hysaw
KARNES
Falls City
Welgang
Burnell
Poehler
Boyce
N. Pettus Wilcox
S. Cesar Wilcox
Pettus Wilcox
GOLIAD
Welder Ranch
VICTORIA
VICTORIA
Pridham Lake
W. Ganado
Lind
JACKSON
Lolita
Francitas
Texana
West Ranch


SOUTH TEXAS
SCALE IN MILES
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REPUBLIC DE MEXICO
Gulf of Mexica
DIMMIT
Carrizo Park
LA SALLE
MC MULLEN
Shiner Ranch
Albert West
Calliham
Oakville Wilcox
Ike
Kittie West
LIVE OAK
Clay West
San Caja
S. Campana
County Line
BEE
Silva
Schwartz
Mt. Lucas
Beasley
Lagarto
Wilcox
REFUGIO
Greta
Tom O'Conner
Refugio
Bonnie View
ARANSAS
Sheriff
SAN PATRICIO
W. Sinton
Round Lake
Odem
East Taft
Midway
Riverside
N. Aqua Dulce
Aqua Dulce
Sayer
CORPUS CHRISTI
NUECES
N. Minnie Beck
Grayton
Bishop
Stratton
JIM WELLS
Richard King
N. Richard King
Forenthal
WEBB
Herech
LAREDO
Cadena
DUVAL
Palangana
East Peters
Piedras Pintas
West Magnolia City
Southland
E. Longhorn
Sejita
Hughes
Aviators
Borregas
Seeligson
KLEBERG
Tijerina
Canales
Unnamed
Blucher
E. Palomitas
La Gloria
Cage
Gyp Hill
Mariposa
ZAPATA
JIM HOGG
BROOKS
Scott & Hopper
Alta Mesa
KENEDY
Charco Redondo
Kelsey
Sun
STARR
N. Rincon
Rincon
Boyle
Flores
S. Ross
Garcia
Holland
HIDALGO
Raymondville
Williamar
WILLACY
Pope Ranch
Los Indios
Mc Allen
Mercedes
Londa
CAMERON
LEGEND:
FIELDS DISCOVERED IN 1946
FIELDS DISCOVERED IN 1946
FIELDS EXTENDED IN 1946

FIG. 1

TABLE I

South Texas Fields Discovered in 1946

County and Field	Type	Completion Date	Discovery Well	Survey	Depth of Prod. Form. (Feet)	Initial Prod. (Bbls./Day)	Choke (Frac. of Inch)	Producing Trend
Atacosa								
Jourdanton	Gas	1- 3-46	Humble, Henry Schorsch 1	Edward Estes	7,263	5 MCF	1/8	Cretaceous
Weigang	Oil	7- 6-46	Smith, Skinner & Eddy, E. F. Weigang 1	A. S. Donovan A-194	3,771	168	5/32	Wilcox
Muil	Gas-Dist.	1-31-46	Quintana Pet. Corp., C. Muil 1	J. C. Mattison 467, A-606	8,937	1,288,000 CF 27 Bbls. Dist.	1/8	Cretaceous
Bee								
Sliva	Oil	4-10-46	Bridwell Oil Co., Sliva Est. 1	F. O. Skidmore	4,378	23	7/64	Frio-Vicksburg
Brooks								
Cage	Gas-Dist.	5-29-46	Shell Oil Co., Cage Ranch 1	J. Guzman 710, A-270	8,022	4½ MCF 100 Bbls. Dist.	1/4	Frio-Vicksburg
Duval								
East Peters	Gas	7-17-46	Edwin B. Cox & Jake Hamon, Leila Peters 1	T. A. Cauitt (BS&F) 194 A-1705	2,613	11½ MCF	1/4	Yegua-Jackson
Goliad								
Poehler	Oil-Gas (Dual)	3-31-46	Jay Simmons, Mary Poehler 1	Jacob Fifer A-120	8,321 8,020	234.6 18 MCF	3/16 Open flow	Wilcox Wilcox
Hidalgo								
Landa	Gas-Dist.	12- 5-46	Stanolind O&G, Harry Landa 1	Agostadero Del Dato	8,380	3 MCF 70 Bbls. Dist.	5/16	Frio-Vicksburg
Jackson								
Lind	Oil	12-22-46	Blanco Buchanan, John Lind 1	J. Heard, A-28	7,059	45	3/32	Frio-Vicksburg
Morales	Gas	5-22-46	Hewitt & Dougherty, A. A. Johnson 1	Wm. Whitaker, A-79	4,156	2.5 MCF	5/32	Frio-Vicksburg
Jim Wells								
East Falfurrias	Gas-Dist.	4-25-46	Shell Oil Co., W. Van Hoogenhuyzel	De la Garza Grt.	9,023	17.8 MCF 108 Bbls. Dist.	3/8	Frio-Vicksburg
West Magnolia City	Oil	6- 1-46	Ralph Fair-Dan Auld, Reynolds & Richardson 1	W. A. Staples 210, A-439	5,402	76	11/64	Frio-Vicksburg
Kleberg								
Unnamed	Oil	11-10-46	Sun Oil Co., E. G. Canales 4	CCSD & RGNE RR 339	10,250	101.55	1/4	Frio-Vicksburg
Live Oak								
Ike	Oil	6-30-46	Continental Oil Co., A. West B-1	J. Jamison 168, A-268	6,787	42.44	9/64	Wilcox
Lagarto	Oil	11-16-46	Roxie Wright, S. F. Beall Est. 1	W. J. Cannon, A-141	6,658	49.68	3/32	Yegua-Jackson
Schwartz	Oil	11-10-46	Henshaw Bros. & E. H. Smith, H. N. Schwartz et al.	Jno. McMullen 7, A-30	4,016	46.4	1/8	Frio-Vicksburg
Clay West	Gas-Dist.	8- 1-46	Continental Oil Co., Clay West Burns 2	W. Sellman 60, A-416	10,121	10½ MCF 33.4 Bbls. Dist.	Open flow	Wilcox
McMullen								
Shiner Ranch	Oil	8- 1-46	Dee Davenport, Annie Graves Dolph A-6	L. Muquz "A" Grt. 12, A-699	1,379	5	Pump	Yegua-Jackson
County Line	Gas	2-13-46	J. W. Gorman, Roos Bros. 1	A. B. & M. 75	1,926	22 MCF	Open flow	Yegua
Milam								
Holcomb	Oil	2- 3-46	R. L. Holcomb et al., J. L. Byrd 2	J. J. Acosta	1,210	54.51	Pump	Cretaceous
Willow Flat	Oil	4- 1-46	McCrary Oil Co., J. R. & M. A. McCrary 1	Niles F. Smith	2,104	38	Pump	Cretaceous
Nueces								
Bishop	Gas	11-12-46	H. R. Smith & W. C. McBride, E. G. Whitten 1	F. Z. Bishop Subd. Weil Rch	7,038	1,000,000 CF	3/16	Frio-Vicksburg
No. Minnie Bock	Gas-Dist.	1-20-46	Atlantic Rfg. Co., Jms. Ewing 1	J. Lopez de Herrera	8,254	3,260,000 CF 48 Bbls. Dist.	1/4	Frio-Vicksburg Frio-Vicksburg
Farenthall	Oil	12-27-46	R. Morgan, Rand Morgan A-1	Casa Blanca Grt.	5,605	113.11	1/8	Frio-Vicksburg
N. Richard King	Gas	10-21-46	Jack Little, Trustee, Emma V. Rieber 1	J. J. de la Garza Montemeyer & Sons Grt.	5,150	33 MCF	Open flow	Frio-Vicksburg
San Patricio								
Beasley	Gas	7-29-46	So. Minerals, John R. & Floyd L. Beasley 1	V. Juarez, A-11	4,900	3,800,000 CF	Open flow	Frio-Vicksburg
East Taft	Oil	9- 4-46	Claude B. Hamill, Ruth P. Sweatt *et vir* 1	John McKee, A-189	5,603	34.15	1/8	Frio-Vicksburg
Round Lake	Oil	11-10-46	Hewitt & Dougherty & Lonnie Glasscock, W. A. Jennings 1	John McMullen, A-17	5,442	32	1/4	Frio-Vicksburg
Starr								
Holland	Oil	5-27-46	W. H. Holland, Roos Bennett 1	Porcion 90	2,959	147.37	1/4	Frio-Vicksburg
Victoria								
Welder	Gas-Dist.	3-12-46	Sterling O&R, J. J. Welder 2	S. A. Belding, A-141	5,690	32½ MCF 48 Bbls. Dist.	1/4	Yegua-Jackson
Webb								
Hirsch	Gas	5- 1-46	Sun Oil Co., Isaac Hirsch 2	Mary Latham 2030	6,905	1,400,000 CF	3/16	Wilcox
Hughes	Oil	8- 9-46	Killam-Hurd, J. G. Garcia Hrs. 1	Hughes Petr. Subd. 592	1,872	110	Pump	Yegua-Jackson
Willacy								
Paso Real	Gas	11- 1-46	Magnolia Pet. Co., F. Armendiaz 2	San Juan de Caericitos Gr.	8,585	13 MCF	Open flow	Frio-Vicksburg

One well was drilled into the basement rocks and another was drilled through the Cretaceous and into Jurassic beds. Exploratory drilling in the Cretaceous fault-line play increased over that for 1945. The 85 wildcat wells accounted for the discovery of 2 oil fields and 2 gas fields, making a total of 5 per cent wildcat wells successfully completed. The wildcat wells drilled in this geological province represent 22.5 per cent of the total exploratory wells drilled in the South Texas district.

A large percentage of the field development was in the deep Edwards limestone fields of Atascosa County. Both oil and gas completions were made in the Navarro sand by wells extending the productive area of the Charlotte field of Atascosa County, opening a new productive pool for this field. The 45 areas in this trend produce 4.5 per cent of the oil from the district.

LOWER EOCENE TREND

Forty-seven wildcat and 148 field wells were drilled in Wilcox and Queen City trends, accounting for 10 per cent of the total drilling activity of the South Texas district. Five new fields, 3 oil and 2 gas, were discovered by exploratory drilling. The initial well of the Poehler field of Goliad County, Jay Simmons' Mary Poehler No. 1, was dually completed as an oil and gas-condensate producer from separate reservoirs of the Wilcox zone.

The Fashing field, extreme southeast corner of Atascosa County, is the most important oil discovery of this trend for the year. The initial well was completed in July and 6 additional oil wells were drilled before the end of the year.

Of the 147 wells drilled in the proved areas, 88 per cent were completed as producers of either oil or gas-condensate. One hundred ten wells were completed as oil wells and 21 wells were gas-condensate productive. One field well in this zone was dually completed.

The multiple pool Falls City field of Karnes County led in field development of this trend with 42 oil completions and no failures. Other active fields in 1946 were the Tulsita-Wilcox field of Bee County with 15 oil wells, the Cabeza Creek field of Goliad County with 8 oil and 3 gas-condensate producers, and the Boyce field of Goliad County where 7 oil wells were completed.

The 31 fields producing from reservoirs of the lower Eocene trend accounted for 4.3 per cent of the total production of the district.

UPPER EOCENE TREND

In all, 406 wells of all categories were drilled in the shallow upper Eocene trend, accounting for 23 per cent of the development of the district. The 141 wildcat wells resulted in the discovery of 3 oil fields and 2 gas fields. Semi-wildcat development opened 3 new oil and 4 gas pools. Most important discovery was probably the new pool development on the flank of the Piedras Pintas salt dome of Duval County where 7 oil wells and 1 gas well were drilled.

Fifty-eight per cent of the 258 field wells were completed as producers while

107 development tests were unsuccessful. Twenty-eight oil, 1 gas, and 13 abandoned wells in the Aviator field of Webb County overshadowed other fields in this trend in number of wells drilled in proved areas. One hundred twenty-five fields producing from reservoirs of upper Eocene age accounted for 20,406,504 barrels of oil, or 15 per cent of the total production from the district.

FRIO-VICKSBURG

The Frio-Vicksburg trends continue to be not only the most active of the 6 geological provinces of the South Texas district, but also the most successful in percentage of productive completions. More wells were drilled to the reservoirs of the Frio-Vicksburg than to those of all other trends combined. Eighteen per cent of the 98 wildcat wells were productive, accounting for the discovery of 10 new oil fields and 8 gas-condensate reservoirs. The Frio-Vicksburg fields discovered in 1946 do not appear to be of major reserve importance or of an average reserve caliber in the trend.

Eight hundred thirty-nine wells drilled in proved areas of this trend resulted in the completion of 730 productive wells, of which 68 were dually completed. Eighty-six per cent of the producers, 684 wells, were oil completions and 114 were gas-condensate wells. Two hundred eighty-eight of the total wells drilled in this trend were located in the Agua Dulce-Stratton to La Gloria-Seeligson part of the Frio-Vicksburg flexure fields. One hundred eighty-five wells were drilled in the Tom O'Connor-Refugio area and 53 wells were drilled in the Willamar field of Willacy County. The 145 fields of the Frio-Vicksburg trend produced 105,323,629 barrels, or 76 per cent of the total production of the South Texas district.

UPPER OLIGOCENE AND LOWER MIOCENE

Less than 1 per cent of the total wells drilled in the district were located in the upper Oligocene-lower Miocene trend, and no new fields were discovered. The fields of this province produced 698,322 barrels of oil during the year.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 31, NO. 6 (JUNE, 1947), PP. 1059-1070, 1 FIG.

DEVELOPMENTS IN EAST TEXAS IN 1946[1]

T. C. CASH[2] AND G. J. LOETTERLE[3]
Tyler, Texas

ABSTRACT

Eight new oil-producing areas and 4 new gas-producing areas were discovered in East Texas during 1946. Three of the new oil discoveries produce from the Woodbine formation. These are North Gallatin and William Wise in Cherokee County and Norman Paul in Wood County. Oil production in the sub-Clarksville sand of the upper Eagle Ford was also discovered in the Norman Paul field. Production in the South Flynn field in Leon County is considered to be from an undifferentiated Woodbine-Eagle Ford section.

Two of the new oil discoveries produce from the Paluxy formation. These are Boynton and Mt. Sylvan, both situated in Smith County. Two new oil fields were discovered in the Travis Peak formation, namely, Elysian Fields in Harrison County and Lassater in Marion County.

The four new gas-producing areas are Pine Hill and South Henderson in Rusk County, which produce from the Travis Peak; Flower Acres in Bowie County, which produces from the Smackover, and Huxley in Shelby County, which produces from the Pettit zone of the lower Glen Rose.

During the year, new producing zones were discovered in 6 older fields. Exploratory drilling was characterized by a continuation of the trend toward deeper drilling which has been in progress for several years.

INTRODUCTION

The oil and gas fields of the East Texas district, including new fields discovered during 1946, are shown on the accompanying map (Fig. 1). This district comprises 42 counties in the northeast part of the state and contains oil and gas fields producing from various formations ranging from the Nacatoch sand of the Upper Cretaceous Navarro group downward to the Smackover limestone of Jurassic age. The district is closely associated structurally with the East Texas basin, and its boundaries coincide approximately with the outer limits of this large structural feature.

The field drilling campaign, initiated in 1945 with the removal of restrictions of the Petroleum Administration for War, continued in 1946, resulting in almost twice as many field wells as were drilled during the previous year. A slight increase in wildcat drilling also took place. A tabular comparison of this drilling activity for the past 2 years is shown in Table I.

The greatly increased number of field completions resulted principally from a drilling campaign in the Hawkins field of Wood County. In all, 146 wells were drilled during the year toward completing the 20-acre spacing program originally planned for this field but suspended during the war. Considerable drilling was also evident during 1946 in the Carthage gas field of Panola County and in the East Texas field.

[1] Presented by title before the Association at Los Angeles, March 24–27, 1947. Manuscript received, April 18, 1947. Published by permission of the Humble Oil and Refining Company.

[2] Humble Oil and Refining Company.

[3] Hudnall and Pirtle, consulting geologists.

OIL & GAS FIELDS OF EAST TEXAS 1946

NEW FIELDS (1946) OLD FIELDS

(2) LOCATION OF IMPORTANT EXPLORATORY TEST (Number Refers to Text)

GENERALIZED GEOLOGIC SECTION EAST TEXAS

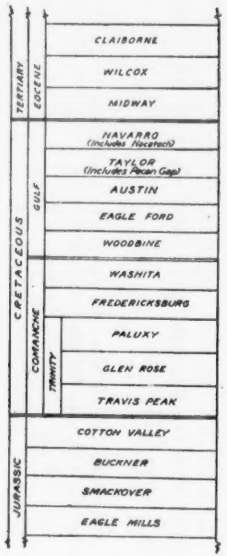

FIG. 1

DISCOVERIES, EXTENSIONS, AND NEW PRODUCING ZONES

During the year, 12 new producing areas were discovered in East Texas, as compared with 5 new discoveries in 1945. Of these 12 new fields, 3 produce from the Woodbine formation, 1 from a downdip undifferentiated Eagle Ford-Woodbine section, 2 from the Paluxy, 1 from the Pettit limestone of the lower Glen Rose, 4 from the Travis Peak, and 1 from the Smackover limestone. Norman Paul, one of the new Woodbine fields, also produces from the sub-Clarksville sand zone of the upper Eagle Ford. Pertinent data regarding these new fields, extensions, and new producing zones are listed in Table II.

NEW FIELDS

Boynton (Smith County).—The Boynton oil field is located in northwestern Smith County, about 12½ miles northwest of Tyler and 2 miles southeast of the town of Mt. Sylvan. The discovery well, Delta Drilling Company's W. H.

TABLE I

COMPARISON OF DRILLING ACTIVITY

	1945	*1946*	*1946 Increase*
Field wells			
Oil wells	150	389	239
Gas wells	124	143	19
Dry holes	32	61	29
Total wells	306	593	287
Wildcat wells			
Oil wells	1	8	7
Gas wells	4	4	0
Dry holes	81	81	0
Total wells	86	93	7
Grand total wells	392	686	294

Boynton No. 1, was drilled to 7,728 feet, in the Paluxy formation. It was completed on December 17, 1946, as an oil well through casing perforations from 7,512 to 7,528 feet, opposite a 10-foot sand body in the upper part of the Paluxy. Initial production was 283.37 barrels of 33.3° gravity oil in 24 hours flowing through a ¼-inch tubing choke with a gas-oil ratio of 158 cubic feet per barrel. Flowing tubing pressure was 175 pounds and casing pressure 210 pounds.

The structure of the Boynton field is probably anticlinal, based on information from older Woodbine dry holes in the general area. Principal leaseholders in the area include the Delta Drilling Company, Magnolia Petroleum Company, Stanolind Oil and Gas Company, Sinclair-Prairie Oil Company, and Humble Oil and Refining Company. The oil is delivered by Humble Pipe Line Company to the Pure Pipe Line Company's line which extends from the Van field in Van Zandt County to Smith's Bluff in Jefferson County.

Elysian Fields (Harrison County).—The Elysian Fields producing area is in

TABLE II

DISCOVERIES AND EXTENSIONS IN 1946

Field	*County*	*Operator*	*Well*	*Location*	*Class*	*Producing Formation*	*Perforated Interval (Feet)*	*Initial Production*	*Discovery Method*
Angus	Navarro	Tex Harvey	Jackson 1	¼ mi. S. of Angus	N. fm.	Wolfe City	1,400–1,450 (OH)	P 30.8 oil 22 SW	Sub.
Angus	Navarro	Tex Harvey	Jackson 2	¼ mi. S. of Angus	N. fm. (gas)	Wolfe City	1,375–1,430 (OH)	30 MCF	Sub.
Boynton	Smith	Delta Drlg. Co.	Boynton 1	2 mi. E. of Mt. Slyvan	New	Paluxy	7,512–7,528	F 283 oil	Sub.; Seis.
Carthage	Panola	Skelly	Matthews 1	NW. part of Field	N. fm. (oil)	L. Pettit	6,262–6,285 6,314–6,330 6,374–6,388	F 58 oil	Sub.
Carthage	Panola	P. A. Pewitt	Carthage Gas Unit 3	SE. part of Field	N. fm. (oil)	Rodessa	5,226–5,230	F 21 oil	Sub.
Elysian Fields	Harrison	Ark. Fuel & R. W. Williams	Furrh Est. 1	10½ mi. SW. of Waskom	New	Travis Peak	6,294–6,308	F 12½ oil	Sub.?
Flower Acres	Bowie	Barnsdall, Sohio, & Phillips	Pickering 1	City of Texarkana	New	Smackover	7,030–7,088 (OH)	8,000 MCF	Seis.
Huxley	Shelby	Humble	Pickering Lbr. 1	17½ mi. SE. of Center	New	Pettit	6,606–6,628	15,000 MCF	Sub.; Seis.
Lassater	Marion	Magnolia & Tide Water	Orr 1	15 mi. NW. of Jefferson	New	Travis Peak	7,568–7,577	P 97 oil	Sub.; Seis.
Manziel	Wood	Lacy & Caraway	Shamburger 1-A	7 mi. NE. of Quitman	N. fm.	Sub-Clarksville	4,146–4,166	P 113 oil	Sub.
Manziel	Wood	Magnolia	Malone-Taylor 2	7 mi. NE. of Quitman	N. fm.	Woodbine	4,784–4,790	P 261 oil	Sub.
Mt. Sylvan	Smith	Humble	Pool. 1	15 mi. NW. of Tyler	New	Paluxy	7,339–7,352	F 522 oil	Surf.; Sub.; Seis.
New Richland	Navarro	T. Hargrove	Wallace 1	2 mi. S. of Richland	N. fm.	Rodessa	5,447–5,454	F 39 oil, 157 SW.	Sub.
Norman Paul	Wood	B. Manziel	Amason 1	5 mi. NE. of Quitman	New	Woodbine	5,237–5,246 5,466–5,488	P 253 oil	Sub.
Norman Paul	Wood	Sun	Clanton 1	5 mi. NE. of Quitman	New	Sub-Clarksville	4,833–4,858	F 181 oil	Sub.
North Gallatin	Cherokee	T. G. Shaw	Bolton 1	8 mi. S. of Jacksonville	New	Woodbine	4,171–4,173	P 38 oil, 90% SW.	Sub.
Opelika	Henderson	Lone Star	Buckalew 1	9 mi. NE. of Athens	N. fm. (oil)	Rodessa	8,827–8,853	F 331 oil	Sub.
Pine Hill	Rusk	H. C. Owens	Rousseau 1	4 mi. SW. of Pine Hill	New	Travis Peak	7,382–7,389	3,100 MCF	Sub.?
Quitman	Wood	Shell	Blalock A-3	3½ mi. N. of Quitman	N. fm.	Eagle Ford	4,185–4,195	P 81 oil	Sub.
South Flynn	Leon	Daniel Oil Co.	Cox Est. 1	13 mi. SW. of Centerville	New	Eagle Ford-Woodbine	7,036–7,428	F 70 oil	Sub.
South Henderson	Rusk	Delta Drlg. Co.	Rayford 1	1½ mi. S. of Henderson	New	Travis Peak	7,310–7,464	441 MCF	Sub.
William Wise	Cherokee	Wise & Delta	Huggins 1	8 mi. SW. of Rusk	New	Woodbine	5,109–5,117 (OH)	F 90 oil	Sub.

Under "Class": New, new pool; Ext., extension; N. fm., new producing formation or zone.
Under "Initial Production": P, pumped; F, flowed; MCF, thousand cubic feet gas per day; oil, barrels per day; SW., salt water per day; Production figures for 24-hour period.
Under "Discovery Method": Seis., Seismograph; Sub., subsurface; Sur., surface.
Under "Perforated Interval": (OH), open hole.

the southeast part of Harrison County about 10½ miles southwest of the town of Waskom. The discovery well, Arkansas Fuel Oil Company-R. W. Williams' J. H. Furrh Estate No. 1, was drilled to 6,851 feet, in the Travis Peak formation. It was completed on May 16, 1946, as an oil well through casing perforations from 6,294 to 6,308 feet, opposite an upper Travis Peak sand. Initial production was 12½ barrels of 42° gravity oil in 24 hours through a ¼-inch tubing choke, with a gas-oil ratio of 5,000 cubic feet per barrel. The flowing tubing pressure was 100 pounds and casing pressure 920 pounds.

According to regional subsurface control, the producing formation is a lenticular sand on the southwest flank of the Waskom gas structure. The well has remained shut in since completion.

Flower Acres (*Bowie County*).—The Flower Acres field is in the west part of the city of Texarkana and about 3 miles northeast of the Eylau field. The discovery well, Barnsdall, Sohio, and Phillips' Ivy Pickering No. 1, was drilled to 7,503 feet, probably in the Eagle Mills formation. It was completed on May 29, 1946, as a gas-condensate well through open hole from 7,030 to 7,088 feet in the upper part of the Smackover limestone. Initial production was 8,000,000 cubic feet of gas in 24 hours on open flow, together with 21 barrels of 71.7° condensate per million cubic feet. Shut-in well-head pressure was 2,600 pounds.

The discovery of this new field is attributed largely to seismic work. Barnsdall and Sohio are the principal leaseholders. At the end of the year the field had no pipeline outlet, and the condensate was being run to storage. The gas, which is high in nitrogen content, is similar to the gas produced from the Smackover limestone in the near-by Eylau field.

Huxley (*Shelby County*).—The Huxley gas field is in southeastern Shelby County, approximately 17½ miles southeast of the town of Center. The discovery well, the Humble Oil and Refining Company's Pickering Lumber Corporation No. 1, reached 12,230 feet, in calcareous shale of the Jurassic section. It was completed, March 26, 1946, as a gas-condensate producer through casing perforations from 6,606 to 6,628 feet, opposite a middle Pettit porous limestone zone of the lower Glen Rose. Initial production on open flow was 15,000,000 cubic feet of gas per day, with an estimated 13 barrels of 55.6° condensate per million cubic feet of gas. Shut-in well-head pressure was 2,847 pounds.

The second well in this field, the Pickering Lumber Corporation No. 2, located 4,800 feet southwest of the discovery, was abandoned as a dry hole on September 25, 1946. Non-commercial showings of gas were obtained in a slightly porous stray zone in the lower part of the Pettit. The middle Pettit producing zone of the discovery well was poorly developed and yielded only non-commercial shows of gas and oil. Oil showings encountered in tight Fredericksburg limestone yielded negative results on testing.

A north-south trending low-relief anticline appears to account for the accumulation in the Huxley area. The Humble Oil and Refining Company and the Pure Oil Company are the principal leaseholders. At the end of the year the field had no pipeline outlet, and the discovery well was shut in.

Lassater (*Marion County*).—The Lassater field is in the west part of Marion County about 15 miles northwest of the town of Jefferson. The discovery well, the Magnolia Petroleum Company and Tide Water Associated-Seaboard Oil Company's F. L. Orr No. 1, was drilled to 10,514 feet, in the lower part of the Cotton Valley formation. It was completed, June 6, 1946, as an oil well through casing perforations from 7,568 to 7,577 feet, opposite a sand in the upper Travis Peak. On official completion gauge, the well pumped 97 barrels of 40.9° gravity oil in 24 hours. The initial production rate has declined materially. Prior to completion, a sand in the lower Travis Peak, or possibly the upper Cotton Valley, yielded gas-condensate and salt water when tested.

A large low-relief anticline in the Lassater area is suggested by subsurface data. Principal leaseholders are the Magnolia and Tide Water-Seaboard. The oil is purchased by Magnolia Pipe Line Company and transported by truck to their pipeline facilities in the Rodessa field.

Mt. Sylvan (*Smith County*).—The Mt. Sylvan field is in northwest Smith County, about 15 miles northwest of Tyler and 4 miles southwest of the community of Mt. Sylvan. The discovery well, the Humble Oil and Refining Company's T. J. Pool No. 1, was drilled to 7,668 feet, in the upper Glen Rose. It was completed on May 1, 1946, as an oil well through casing perforations from 7,339 to 7,352 feet, opposite a sand section in the upper part of the Paluxy. Initial production was 522.5 barrels of 34.6° gravity oil in 24 hours through a $\frac{1}{4}$-inch tubing choke, with a gas-oil ratio of 145 cubic feet per barrel. Tubing pressure was 400 pounds and casing pressure 460 pounds. During the year, 4 dry holes and a second producer were completed in the field. These wells disclosed a very erratic sand development in the Paluxy formation. While insufficient wells have been drilled to definitely account for the oil accumulation, it appears that production is associated with lenticular sand development. The Humble Oil and Refining Company is the principal operator in this field. The oil is delivered by Humble Pipe Line Company to the Pure Pipe Line Company's line in Van Zandt County.

Norman Paul (*Wood County*).—The Norman Paul field is in central Wood County, about 5 miles northeast of the town of Quitman. The discovery well, Bobby Manziel's A. L. Amason No. 1, reached 5,522 feet, in the Woodbine formation. It was completed on August 30, 1946, as an oil well through casing perforations from 5,237 to 5,246 and 5,466 to 4,588 feet, opposite sands in the upper Woodbine. On initial completion the well pumped 253 barrels of 16.5° gravity oil in 24 hours.

Following this discovery, the Sun Oil Company's G. L. Clanton No. 1, located 2,100 feet southwest of the Manziel well, was drilled to 5,513 feet, in the Woodbine. It failed to find oil in the Woodbine but was completed on December 4, 1946, as an oil well in the sub-Clarksville sand zone of the upper Eagle Ford. Production was through casing perforations from 4,833 to 4,850 feet and 4,854 to 4,858 feet. On completion gauge, the well flowed 180.9 barrels of 33° gravity oil in 24 hours through a $\frac{1}{4}$-inch tubing choke, with a gas-oil ratio of 167 cubic

feet per barrel. The tubing pressure was 445 pounds and casing pressure 260 pounds. The producing formation in this new field is on the upthrown southeast side of a northeast-southwest trending fault. The principal leaseholders are Bobby Manziel, Sun Oil Company, and Jackson and Fisher. The oil is trucked to Mt. Pleasant and is purchased by the Talco Asphalt and Refining Company.

North Gallatin (*Cherokee County*).—The North Gallatin field is in the north-central part of Cherokee County, approximately 8 miles south of the city of Jacksonville. The discovery well, T. G. Shaw's John H. Bolton No. 1, was drilled to 4,177 feet, in the Woodbine formation. It was completed on March 6, 1946, through casing perforations from 4,171 to 4,173 feet. On completion gauge, the well pumped 37.8 barrels of 40.1° gravity oil and 340 barrels of salt water in 24 hours. After producing only 388 barrels of oil, the well was plugged and abandoned on December 26, 1946. Subsurface control in this area indicates a small local closure along an east-west trending fault. Several former abandonments in this area encountered small showings of oil in the Woodbine.

Pine Hill (*Rusk County*).—The Pine Hill gas-condensate area is in extreme eastern Rusk County about 4 miles southwest of the Pine Hill community. The discovery well, H. C. Owens *et al.*, J. H. Rousseau No. 1, was drilled to 7,512 feet, in the upper Travis Peak formation. It was completed on August 21, 1946, as a gas-condensate well through casing perforations from 7,382 to 7,389 feet, opposite an upper Travis Peak sandstone. Initial production was 3,100,000 cubic feet of gas per day, together with an estimated 25 barrels of 57° gravity condensate per million cubic feet. Shut-in well-head pressure was 2,950 pounds.

The producing formation in the Pine Hill field appears to be a lenticular sand on the west flank of the large Carthage nose. H. C. Owens is the principal leaseholder. At the end of the year the well was shut in.

South Flynn (*Leon County*).—The South Flynn field is in the southwest part of Leon County, about 13 miles southwest of Centerville and 3½ miles southeast of the Flynn community. The discovery well, the Daniel Oil Company's F. A. Cox Estate No. 1, was drilled to 7,444 feet, in Comanche limestone. It was completed on December 12, 1946, as an oil well through casing perforations at various intervals from 7,036 to 7,428 feet, opposite an undifferentiated Eagle Ford-Woodbine section comprising dark laminated fossiliferous shale and sandy shale containing thin tight sandstone streaks. On initial completion, the well flowed by heads a total of 70.42 barrels of 33° gravity oil and 2.18 barrels of mud and wash water in 24 hours through a ¼-inch tubing choke.

The presence of oil in this area was previously indicated by the Claude Bell *et al.*, B. W. and J. O. Carson No. 1, located 8,000 feet northeast of the discovery well, which produced a small amount of oil from this section. At the end of the year a third well, the United North and South Development Company's R. L. Oden No. 1, located 7,000 feet northwest of the discovery, was testing oil showings in this same undifferentiated section. This latter well penetrated the Fredericksburg limestone, but failed to encounter any effective porosity.

Subsurface information to date suggests anticlinal structure with some faulting in the area. Sinclair Pipe Line Company is currently purchasing the oil.

South Henderson (*Rusk County*).—The South Henderson field is located 1½ miles south of the town of Henderson in west-central Rusk County. The discovery well, the Delta Drilling Company *et al.* C. G. Rayford No. 1, was drilled to 7,517 feet, in the Travis Peak formation. It was completed on May 17, 1946, as a gas-condensate well through casing perforations from 7,310 to 7,464 feet, opposite an upper Travis Peak sandstone section. Initial production was 441,090 cubic feet of gas, together with 7.54 barrels of 59° gravity condensate in 24 hours through a ⅛-inch tubing choke. Flowing tubing pressure was 2,138 pounds. Noncommercial showings of oil and gas were encountered in the overlying Pettit limestone zone which was only slightly porous. The structure appears to be a small, low-relief anticline. At the end of the year there was no pipeline outlet, and the condensate production was carried to lease storage.

William Wise (*Cherokee County*).—The William Wise field is located in southern Cherokee County, approximately 8 miles southwest of the town of Rusk and 2 miles south of the old, depleted Rusk field. The discovery well, the Watson Wise and Delta Drilling Company's J. O. Huggins No. 1, reached the total depth of 5,117 feet in the Woodbine formation. It was completed on August 8, 1946, as an oil well with open hole from 5,109 to 5,117 feet. Initial production was 90.3 barrels of 41.8° gravity oil in 24 hours through a ⅛-inch tubing choke, with a gas-oil ratio of 251 cubic feet per barrel. Tubing pressure was 450 pounds and casing pressure 900 pounds. Following the discovery, 4 oil wells and 1 dry hole were completed in the area during the year.

The structure in the William Wise field is a low-relief dome superimposed on the regional South Rusk nose. Watson Wise, the Delta Drilling Company, and the Allied Oil Company are the principal operators. The oil is trucked to Rusk and shipped by tank car to the British-American Oil Company's refinery at Moose Jaw, Canada.

FIELD DEVELOPMENTS

Angus (*Navarro County*).—During the year oil and gas were discovered in the Wolfe City sand in the old Angus field which formerly produced both oil and gas from the shallower Nacatoch sand. The Tex Harvey Oil Company completed a 30-barrel pumping oil well and a 30,000 cubic feet gas well, and 2 dry holes were drilled in the immediate area. The Wolfe City producing formation has an average depth of 1,450 feet. Because of the lenticular and erratic sand in this area, the reserves are not important.

Carthage (*Panola County*).—The active development program in progress during the last few years in the Carthage gas field continued in 1946. In all 110 wells were completed during the year, of which 68 were dual completions, 39 were single completions, and 3 were dry holes. On January 1, 1947, there were 245 producing wells in the field, consisting of 154 dual producers and 91 single completions.

Cumulative gas production to that date was about 170,795,000 MCF, and cumulative condensate production was approximately 3,275,000 barrels. A tabulation of completions by producing zones follows.

Zone	*Gas Completions*	*Oil Completions*
Rodessa	25	1
Upper Pettit	159	—
Lower Pettit	197	1
Travis Peak	10	6
Total completions	391	8

At the close of 1946, four gasoline plants were serving the field. These included the Lone Star Gas Company plant with a daily capacity of 50,000,000 cubic feet, the Chicago Corporation plant with a daily capacity of 125,000,000 cubic feet, the Arkansas Fuel Oil Company plant with a daily capacity of 25,000,000 cubic feet, and the United Gas Company plant with a daily capacity of 150,000,000 cubic feet. Recycling operations are also carried out in connection with the Lone Star Gas Company's plant.

During 1946, oil was discovered in the lower Pettit in the Skelly Oil Company's S. E. Matthews Unit No. 1 on the northwest side of the field. Oil was also discovered in the Hill (Rodessa) section in the Paul A. Pewitt, Carthage Gas Unit No. 3, on the southeast side of production. Based on the results of extensive drilling in both these reservoirs to date, the occurrence of oil in these zones will be confined to a limited area.

East Texas field.—Developments in the East Texas field during 1946 include the completion of 62 oil wells and 1 dry hole, and the abandonment of 613 wells. On January 1, 1947, 4,105 wells had been abandoned, leaving 23,366 producing wells. Cumulative production to January 1, 1947, was about 2,357,500,000 barrels. Following is a tabulation of the well status at the end of 1946, with comparative figures at the close of 1945.

	1945	*1946*
Flowing	14,717	13,690
Pumping	8,872	9,365
Dead	337	311
	23,926	23,366

On January 1, 1947, there were 77 salt-water injection wells in the field through which 459,323 barrels of salt water were being returned daily to the Woodbine formation. This was 95.81 per cent of the total water produced, and the injection of this large volume of water assists materially in maintaining the reservoir pressure.

Hawkins (Wood County).—Increased drilling activity in the Hawkins field, which began in 1945 upon rescission of P.A.W. restrictions, continued during 1946. In all, 139 oil wells and 7 dry holes was completed during the year, and 1 well was junked and abandoned. Since the field's discovery in December, 1940, to January 1, 1947, total field completions include 597 oil wells, 4 gas wells, and 36 dry holes. During this period, 3 oil wells, 9 high gas-oil ratio wells, and 3 gas

wells were abandoned. Cumulative production from the Hawkins field as of January 1, 1947, was approximately 61,750,000 barrels of oil.

A projected Smackover limestone test, the Humble Oil and Refining Company's P. H. McKnight No. 1, on the north flank of the structure, was drilling at the end of 1946 in the Travis Peak formation at the depth of 10,452 feet. A drill-stem test of the sub-Clarksville (upper Eagle Ford) sand recovered a small quantity of oil and suggested the possibility of pumping production. A small amount of gas and condensate was recovered on a drill-stem test of a Rodessa calcareous sandstone encountered from 8,935 to 8,965 feet.

Manziel (*Wood County*).—Developments in the Manziel field during 1946 were featured by the discovery of oil in the sub-Clarksville sand of the Eagle Ford formation. The discovery well, Rogers Lacy and R. J. Caraway's J. G. Shamburger No. 1-A, a failure in the Paluxy formation, was plugged back and completed as a sub-Clarksville oil producer on August 13, 1946. On completion gauge, the well pumped 113 barrels of 16.2° gravity oil and 1.14 barrels of salt water in 24 hours through casing perforations from 4,146 to 4,166 feet. Samples and the electric log indicate about 20 feet of fine-grained, silty saturated sand. Following this discovery, 4 additional oil wells were completed in this zone.

Production was also discovered in the Woodbine formation by the Magnolia Petroleum Company's Malone-Taylor Unit No. 2, which was completed on August 14, 1946, after plugging back from the total depth of 6,580 feet, in the Paluxy formation. On initial test, the well pumped 261.36 barrels of 26° gravity oil and 65.34 barrels of water in 24 hours through casing perforations from 4,784 to 4,790 feet, opposite a sand at the top of the Dexter section of the Woodbine. The principal producing zone in this field is the Paluxy formation, and the Woodbine production (found only in this well) is believed to be local and associated with minor faulting.

During the year, 8 oil wells and one dry hole were completed in the field. Of the oil wells, 2 produce from the Paluxy formation, 5 from the sub-Clarksville, and 1 from the Woodbine. Cumulative production to January 1, 1947, was about 1,660,000 barrels.

New Richland (*Navarro County*).—During 1946, the Temple Hargrove, Guy E. Wallace No. 1, west of the depleted Woodbine oil field, was drilled to 6,184 feet, in the Travis Peak formation, and became the discovery well in a Rodessa oil sand. It was completed on October 5, 1946, through casing perforations from 5,447 to 5,454 feet. Initial production was 39.25 barrels of 23° gravity oil and 157 barrels of salt water in 24 hours through a 1-inch choke. Tubing pressure was 23 pounds and casing pressure 1,475 pounds. Temple Hargrove, the Gulf Oil Corporation, the Crown Central Petroleum Corporation, Wheelock and Collins, and the Humble Oil and Refining Company are the principal leaseholders in the area. The oil is purchased by the Humble Pipe Line Company.

Opelika (*Henderson County*).—During the year, oil was discovered at Opelika

in the Rodessa section which had previously yielded gas-condensate production. The Rodessa oil discovery, the Lone Star Producing Company's Ira Buckalew No. 1, on the northwest flank of the structure, was dually completed on March 19, 1946. Initial production from the lower Rodessa porous zone was 331 barrels of 41.9° gravity oil in 24 hours through a ¼-inch choke and casing perforations from 8,827 to 8,853 feet. Casing pressure was 775 pounds and the gas-oil ratio 1,228 cubic feet per barrel. Initial production from the Pettit zone through casing perforations from 9,351 to 9,389 feet was 35,000,000 cubic feet of gas per day on open flow, together with an estimated 12–15 barrels of condensate per million cubic feet. Shut-in tubing pressure was 3,500 pounds.

During the year, 8 producing wells were completed in the Opelika field. These include 2 dual Rodessa oil and Pettit gas-condensate completions, 5 single Rodessa completions, and 1 single Rodessa gas-condensate completion.

Quitman (Wood County).—During the year, oil was discovered in the Quitman field in a 6-foot stray sand in the lower part of the Eagle Ford formation, approximately 210 feet above the Woodbine. The discovery well, the Shell Oil Company's J. R. Blalock No. A-3, was completed on July 31, 1946, through casing perforations from 4,185 to 4,195 feet. On completion gauge, the well pumped 81.17 barrels of 27° gravity oil in 24 hours. Oil had previously been discovered in this field in the Paluxy formation, which is the principal producing zone, and also in a lower Eagle Ford sand lying stratigraphically below the stray sand producing in the new discovery.

During the year, 9 oil wells and 2 dry holes were completed in the Quitman field. Of the oil completions, 6 were in the Paluxy formation, 2 were in the so-called lower Eagle Ford sand, and 1 was completed in the newly discovered stray sand. On January 1, 1947, there were 68 wells in the Quitman field producing from the Paluxy formation. Cumulative production to that date was about 7,212,000 barrels.

At the close of the year, a projected Smackover limestone test, the Shell Oil Company's J. B. Goldsmith No. 12, in the southwest portion of the field, was drilling in the lower Glen Rose at 8,361 feet. From results of a drill-stem test of the upper Rodessa at 7,820–7,873, it appears that a broken sand section in this interval may yield commercial gas-condensate.

SIGNIFICANT WILDCAT WELLS

Jurassic tests.—During the year, 6 Jurassic exploratory wells were drilled at widely scattered locations in the East Texas district. Aside from the Barnsdall, Sohio, and Phillips' Ivy Pickering No. 1, which resulted in the discovery of the Flower Acres field in Bowie County as previously discussed, perhaps the most interesting Jurassic test was the Phillips Petroleum Company's Amelia Englander No. 1. This well is ½ mile north of the village of Flint, in southwest Smith County (No. 1, Fig. 1). It was drilled to the total depth of 13,781 feet, in red

and green sandy clay and green silty sandstone of probable Cotton Valley age, and is the deepest test in the East Texas basin. No showings of oil or gas were reported.

The Texas Company's W. M. White No. 1, in the Fairfield gas-condensate area of Freestone County (No. 2, Fig. 1), was drilling at the close of the year at a depth of 13,205 feet, in hard dense limestone probably Smackover in age. The lower Cotton Valley-Buckner-Smackover section in this well is composed principally of dense argillaceous limestone, oölitic limestone, dolomite, and minor amounts of black shale and anhydrite. No redbed facies was encountered, but there were some porous dolomitic and oölitic limestone zones in the lower part of the section without any reported showings.

The Sinclair-Prairie Oil Company's D. D. Shofner No. 1, a deep test in the south-central part of the Chapel Hill field of eastern Smith County (No. 3, Fig. 1) and discussed at length in the development paper for 1945, was completed during the year as a gas-condensate well in the Pettit limestone, one of the regular field zones. This well had previously reached the total depth of 13,577 feet, in a Jurassic section of sand, shale, and salt believed to be Eagle Mills in age. Showings of gas were encountered in the Cotton Valley formation and in a limestone section probably Smackover in age, but mechanical difficulties prevented thorough testing of these deeper zones.

Lower Glen Rose and Travis Peak tests.—In 1946 there were 27 lower Glen Rose and Travis Peak tests drilled at various locations in the East Texas basin. Four of these wells resulted in new discoveries, as previously mentioned. Among important tests in the active category at the end of the year was the Standard Oil Company of Texas' New Birmingham Development Company No. 1, situated 4 miles northwest of Maydelle in western Cherokee County (No. 4, Fig. 1). At the close of the year this well had reached 10,017 feet, in the Travis Peak formation and had set casing preparatory to testing gas showings in the Travis Peak and Rodessa sections. Cores and a drill-stem test of the Rodessa from 8,638 to 8,662 feet suggested this to be the most promising zone.

Woodbine tests.—In a continuing effort to extend Woodbine production in the south part of the East Texas basin, 4 Woodbine wildcats were drilled in 1946 in Houston County and 2 in Leon County. All resulted in dry holes except the previously discussed Daniel Oil Company's F. A. Cox Estate No. 1, which is officially credited as the discovery well for the South Flynn field of Leon County.

Among the dry holes, perhaps the most significant was W. T. Moran and J. S. Ivy's G. L. Murray and Sons No. 3, in the Creek area of southwest Houston County (No. 5, Fig. 1). Earlier wells in this area had discovered a thick, porous Woodbine sand section with minor showings of oil at the top and had initiated the Woodbine exploratory campaign which has been in progress for the past 2 years in the south part of the East Texas district. The Murray and Sons No. 3 penetrated the deeper Edwards (Fredericksburg) limestone but failed to encounter any effective porosity in that zone.

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DEVELOPMENTS IN UPPER GULF COAST OF TEXAS IN 1946[1]

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ABSTRACT

In 1946, 679 wells of all classifications were drilled in the Upper Gulf Coast of Texas. Of this number, 320 were classified as exploratory wells and 359 as field-development wells.

Among the exploratory wells, 121 were new-field wildcats, of which 14, or 11.6 per cent, were successful and 107 were failures; 112 were new-pool wildcats, of which 40 or 35.7 per cent, were successful and 72 were failures; 83 were extension wells or outposts. Of this number 39, or 47 per cent, were successful and 44 were failures.

Drilling showed a marked decline in 1946, with 679 operations compared with 911 during 1945. The greater part of this decline was in field-development wells, 359 compared with 563 in 1945. Exploratory drilling remained about the same with 316 operations compared with 348 in 1945.

New-field discoveries decreased from 26 in 1945 to 14 in 1946, while new sand discoveries in proved fields increased from 72 in 1945 to 80 in 1946. The new-field discovery rate in 1946 was 1 out of 8.6 wildcat wells drilled as compared with 1 out of 5 in 1945.

Of the 14 fields discovered in 1946, 6 were gas-condensate producers and 8 were oil fields. The Frio trend led the discovery list with 8 fields, and there were 2 each in the Yegua, Wilcox, and the Edwards of Lower Cretaceous age.

Most of the producing areas were localized by reflection seismograph after subsurface studies had indicated their possible presence.

The average quality of these fields is not impressive and their effect on production rates and reserves will probably be small. At the end of the year 1 was abandoned and 8 were still in the 1-well stage, and the field showing the greatest development had 6 wells completed.

Production in 1946 remained about the same as in 1945, approximately 183,000,000 barrels.

Reflection seismograph work showed a decline of 5 per cent in crew weeks as compared with 1945. Gravity exploration showed a decline of 32 per cent as compared with 1945.

Leasing activities along the Frio and Yegua-Wilcox trends remained about the same as in the preceding year.

A new objective, the Edwards limestone of Lower Cretaceous age, was added to the list of producing formations in 1946. This trend will cover the extreme northern part of the area. Two fields and one new pool, all producing gas and condensate, were discovered.

INTRODUCTION

The Upper Gulf Coast of Texas includes 25 counties in southeast Texas, extending northeastward from Matagorda and Brazos counties to the Louisiana state line. This district is shown in Figure 1.

DEVELOPMENT

Both field development and exploratory drilling declined in 1946, with 679 operations as compared with 911 in 1945. The greater part of this decline was in field-development wells, or wells offsetting production. In this classification 359 wells were drilled in 1946 as compared with 563 in 1945. Exploratory drilling compared more favorably, with 316 operations as compared with 348 in 1945.

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[2] Sun Oil Company.

[3] Independent. The writers acknowledge with thanks the help and criticism of their associates in preparing and assembling the material for this paper, and their indebtedness to the Sun Oil Company, the committee on statistics of exploratory drilling, and the *Oil Weekly*, on whom they have drawn heavily for information.

TRINITY
GLENDALE
RITTEL
MADISON
MADISONVILLE
BRAZOS
GRIMES
WALKER
SAM HOUSTON
POLK
TYLER
JASPER
NEWTON
LOUISIANA
SAN JACINTO
SO. HYATT
OLIVE
SIGSBEE
W. SILSBEE
W. MERCH
McCOY
HARDIN
SARATOGA
WASHINGTON
MONTGOMERY
LIBERTY
SOUR LAKE
ORANGE
ORANGE
N. PORT NECHES
TOMBALL
MUMBLE
HULL
SO. LIBERTY
AUSTIN
WALLER
JOSEY RANCH
ALDINE
N. DELHI
N. HOUSTON
LOVELLS LAKE
GILBERT RANCH
N. WINNIE
HARRIS
CHAMBERS
JEFFERSON
COLUMBUS
RAMSEY
ALTAIR
COLORADO
A. BERNARD
MCDUFF
DOUBLE BAYOU
CEDAR POINT
SO. MAYES
MAIN ISLAND
FT BEND
RED FISH REEF
CAPLEN
WHARTON
GALVESTON
CHOCOLATE BAYOU
LIVERPOOL
DANBURY
LAKEVIEW
MEXICO
SO. EL CAMPO
WITTERS
W. COLUMBIA
ANGLETON
W. EL CAMPO
DAMON
BLUE LAKE
ALEDO
SCOBY LAKE
BRAZORIA
SUGAR VALLEY
STRATTON RIDGE
MIDFIELDS
LUCKY
TIDE HAVEN
BLESSING
EAST BLESSING
MATAGORDA
GULF
OF
UPPER GULF COAST DISTRICT
OF TEXAS
1946 DISCOVERIES
LEGEND
NEW PRODUCING FIELDS 1946
EXTENSIONS AND NEW SANDS ON OLD DOMES 1946
0 10 20 30 40 50
SCALE IN MILES

FIG. 1

Following the classification of the committee on statistics of exploratory drilling, the exploratory wells were classified as follows: 121 were new-field wildcats, of which 107 were dry and 14, or 11.6 per cent, were successful; 112 were new-pool wildcats, of which 72 were dry and 40, or 35.7 per cent, were successful; and 83 were outposts, of which 44 were dry and 39, or 47 per cent, were successful.

It is interesting to note that the last two classifications, namely, new-pool wildcats and outposts, had a much higher rate of successful completions than the first classification—new-field wildcats. This, of course, is because the former are on known structure and adjacent to production, thus reducing the risk; while the latter are at a distance from production and on little known structure, or one which has not produced.

NEW FIELDS DISCOVERED

Six of the new fields were classified as gas-condensate fields and 8 as oil fields. Eight of the newly discovered fields are producing from the *Marginulina*-Frio zone of Oligocene age, 2 from the Yegua, and 2 from the Wilcox, both of Eocene age, and 2 from the Washita-Fredericksburg of Lower Cretaceous age.

The average quality of these fields is not impressive and their effect on production rates and reserves will probably be small. At the end of the year 1 was abandoned and 8 were still in the 1-well stage. The field showing the greatest development had 6 wells completed.

Of the 25 counties in this district, 10 were credited with discoveries. Matagorda County led the list with 3 discoveries, Brazoria and Chambers counties followed with 2 each, and the other 7 with 1 each. The new discoveries, with pertinent data, are listed in Table I. Their locations are shown in Figure 1.

The Midfields field in Matagorda County was the first discovery of the year, and was more rapidly developed than any. At the end of the year 6 wells had been completed in a 9,100-foot Frio sand which occurs approximately 2,700 feet below the top of the Frio.

The McCoy field in Liberty County had 5 completions and 3 dry holes at the end of the year. Its structure is indicated to be the downthrown side of a strike-fault block. Although indications are that production will cover a large area, the oil zone is thin and contour drilling will be necessary for oil-well completion.

The South Mayes field in Chambers County had 2 oil wells, 1 gas well, and 2 dry holes at the close of the year. Production is from the second upper Frio sand. Producing levels and results indicate the field is divided by numerous small faults and separated and controlled by a large strike fault. Only a small area is proved productive by present wells, but at the turn of the year a long southwest outpost is drilling and the field may become important. This field is closely associated with, and separated by faulting from, the Mayes and White Lake fields.

The North Port Neches field in Orange County had 2 wells completed and a third drilling at the end of the year. Production is from the lower Hackberry or

TABLE I

Fields Discovered in Upper Gulf Coast in 1946

Field Name	County	Operator	Discovery Well	Producing Formation	Producing Depth (Feet)	Initial Production
1. Liverpool	Brazoria	Pan American	Callihan 1	Frio	8,757–62	331 bbls. oil, 14 bbls. SW.; 12/64″ ch.; R 519-1. Abandoned 11-15-46
2. Scoby Lake	Brazoria	McCarthy	S. B. Nickell 1	Frio	9,100–10	75 bbls.; Gr. 56°; R 50,000-1
3. South Mayes	Chambers	Humble	Wallis *et al.*, 1	Frio	9,194–98	264 bbls.; 3/16″ ch.; Gr. 36.6°; R 8,360-1
4. East Red Fish Reef	Chambers	Standard of Texas	State Land Tr. 201, 1	Frio	8,752–66	280 bbls; 1/4″ ch.; Gr. 53.6°; R 11,490-1
5. McCrary	Ft. Bend	O. S. Martin	McCrary 1	Yegua	7,323–30	12 1/2 bbls. oil, 12 1/2 bbls. SW.; 7/64″ ch.
6. McCoy	Liberty	Ohio Oil	Kirby Lumber Co. 1	Wilcox	9,108–12	100 bbls. oil; 10/64″ ch.; Gr. 32.2°; R 454-1
7. Madisonville	Madison	West Prod. *et al.*	Boring 1	Edwards	9,495–9,630	1,530 MCF Gas, 39 bbls.; 1/4″ ch.; Gr. 55.8°; R 27,000-1
8. Midfields	Matagorda	Sun Oil	Strandel 2	Frio	9,134–36	229 bbls.; 1/8″ ch.; Gr. 32.5°; R 1,314-1
9. East Blessing	Matagorda	Amerada	Laughlin 1	Frio	8,834–47	132 bbls.; 9/64″ ch.; Gr. 47.2°; R 1,250-1
10. Tidehaven	Matagorda	Magnolia	Live Oak Farms 1	Frio	8,450–56	160 bbls.; 1/8″ ch.; Gr. 41°; R 744-1; 14 bbls. fresh water
11. North Port Neches	Orange	Hinkle Drlg. Co.	Adcock 1	Frio	8,774–78	330 bbls.; 10/64″ ch.; Gr. 37.4; R 732-1
12. West Mercy	San Jacinto	Fred V. Manning	Central Coke and Coal 1	Wilcox	8,310–45	14.4 bbls.; 13/64″ ch.; Gr. 50.2; R 19,307-1
13. Glendale	Trinity	Magnolia	Bolton 2	Edwards	10,500–40	66 bbls.; 1/4″ ch.; Gr. 48.8°; Cal open flow 38,000 MCF gas per day
14. Sam Houston	Walker	Moran Oil	Gibbs Bros. 1	Yegua	2,360–70	Pump 16.56 bbls.; Gr. 23.5°

Abbreviations: 1/4″ ch., 1/4-inch choke; Gr., gravity; R, gas-oil ratio.

TABLE III

Important Outposts (Extensions) in Upper Gulf Coast in 1946

Field	County	Operator	Well	Depth to Production (Feet)	Type	Remarks
1. Angleton	Brazoria	Humble	Mettler 1-B	10,436	Gas	2,640-foot NE. extension
2. Chocolate Bayou	Brazoria	Stanolind	Houston Farms 1-B	11,460	Oil	2,640-foot SW. extension
3. Pledger	Brazoria	Humble	Carter 1	6,840	Gas	1-mile NE. extension
4. Double Bayou	Chambers	Humble	Barrows 2	9,006	Gas condensate	4,000-foot NE. extension
5. Columbus	Colorado	Texas Gulf	Landig 1	7,891	Oil	4,000-foot NE. extension
6. Ramsey	Colorado	Cities Service	Krider 1	8,873	Gas condensate	3,500-foot S. extension
7. High Island	Galveston	Stanolind	State Tract 2, No. 1	6,434	Oil	2,640-foot S. extension
8. Olive	Hardin	Pan American	Sternenberg 2	10,140	Oil	2,640-foot NW. extension
9. Olive	Hardin	Pan American	Sternenberg 3	10,100	Oil	2,640-foot W. extension
10. Silsbee	Hardin	American Republic-Houston Oil	Ellery Fee 2	7,290	Oil	2,640-foot SW. extension
11. North Delhi	Harris	Sun Oil	Martin-Davis 1	7,056	Gas	4,000-foot SW. extension
12. North Houston	Harris	Union Producing	Langtry 1	7,490	Gas condensate	5,000-foot NE. extension
13. Josey Ranch	Harris	Josey	Josey Fee 2-A	6,958	Gas condensate	3,500-foot N. extension
14. McCoy	Liberty	Ohio	Kirby Lumber Tract 3, No. 1	9,144	Oil	1-mile SW. extension
15. Sugar Valley	Matagorda	Skelly	Lawrence 1	8,995	Oil	3,000-foot NW. extension
16. Daboval	Wharton	Karsten	Lillie 1	7,230	Gas	3,000-foot SW. extension

TABLE II

NEW POOLS (NEW SANDS) IN UPPER GULF COAST IN 1946

Field	County	Operator	Well	Depth to Production (Feet)	Type	Producing Formation
1. Blue Lake	Brazoria	McCarthy	Holland 1	11,014	Gas condensate	Hackberry
2. Danbury	Brazoria	Humble	Moller 5-B	6,228	Oil	Frio
3. Chocolate Bayou	Brazoria	Phillips	Armstrong 1	10,695	Gas condensate	Frio
4. Stratton Ridge	Brazoria	Cockrell	Seaburn 5	4,581	Oil	Miocene
5. West Columbia	Brazoria	Hogg Oil	Fee 10-A	6,122	Oil	Frio
6. West Columbia	Brazoria	Fidelity	Wilson 2	3,312	Oil	Miocene
7. Blue Lake	Brazoria	McCarthy	Stevens 1	9,140	Gas	Frio
8. South Mayes	Chambers	Humble	Frankland 1	9,120	Gas	Frio
9. Red Fish Reef	Chambers	Humble	State Trust 225, 35A	11,067	Gas condensate	Frio
10. Cedar Point	Chambers	Standard of Texas	State Trust 118, 3M	3,900	Oil	Miocene
11. Altair	Colorado	Superior	Pryor 4-A	10,192	Gas condensate	Wilcox
12. Caplen	Galveston	Mitchell	Smith 1	4,035	Oil	Miocene
13. Saratoga	Hardin	Josey	Caswell 2	5,866	Oil	Yegua
14. Sour Lake	Hardin	Texas Company	Fee 326	5,210	Oil	Yegua
15. West Silsbee	Hardin	American Rep.-Houston Oil	Ellery Fee 1	7,710	Oil	Yegua
16. Humble	Harris	Sun Oil	Bender 43	3,045	Oil	Frio
17. Aldine	Harris	Corzelius	Hairgrove 1-A	7,540	Gas condensate	Yegua
18. Tom Ball	Harris	Humble	Milo 10	6,159	Gas condensate	Yegua
19. North Winnie	Jefferson	McCarthy	Tyrrell 3	10,169	Oil	Hackberry
20. Lovells Lake	Jefferson	Humble	Jefferson Land 40	9,030	Gas condensate	Frio
21. Gilbert Ranch	Jefferson	Sun Oil	Gilbert 2	8,742	Gas condensate	Hackberry
22. Hull	Liberty	American Republic-Houston Oil	Dolbear 175	4,880	Oil	Yegua
23. McCoy	Liberty	Ohio Oil	Quinn 2-A	9,131	Oil	Wilcox
24. South Liberty	Liberty	Bashara	Pickett 2	3,902	Oil	Yegua
25. South Liberty	Liberty	Sun Oil Co.	Schade-Fee 12	4,615	Oil	Cook Mt.
26. Sugar Valley	Matagorda	Superior	Culbertson 1	8,276	Oil	Frio
27. Sugar Valley	Matagorda	Superior	Thomasson 1	8,772	Oil	Frio
				9,086	Condensate	
28. Sugar Valley	Matagorda	Stanolind	Hurlock 1	8,995	Oil	Frio
29. Lucky	Matagorda	Stanolind	Thompson 1	10,198	Gas condensate	Frio
30. Blessing	Matagorda	American-Liberty	Braden 1	8,467	Gas condensate	Frio
31. Orange	Orange	Bowles	Granger 1	4,735	Gas	Frio
32. Hyatt	Tyler	Atlantic	Dempsey 1	10,272	Gas condensate	Wilcox
33. Kittrell	Walker	Magnolia	Texas Long Leaf Lumber 2-A	10,575	Gas condensate	Edwards
34. East Bernard	Wharton	Cockburn	Burns 1	7,916	Gas	Yegua
35. El Campo	Wharton	Seaboard	Peterson 1	6,965	Gas	Frio
36. West El Campo	Wharton	Karsten	Reitz 1	6,842	Gas	Frio
37. Lakeview	Wharton	Clark	Tobola 1	4,806	Gas	Frio
38. Lakeview	Wharton	McDannald	Mitchell 1-B	3,978	Gas	Miocene
39. Lakeview	Wharton	Lakeview Oil	Johnston 1	4,526	Oil	Frio
40. Withers	Wharton	Texas Co.	Pierce C-122	6,667	Gas condensate	Frio

lower Marine Frio. This is considered the most important discovery of the eastern Texas Gulf Coast, as it establishes the lower Marine Frio as an objective where it pinches out on major structures along this strike. North Port Neches is not a new field in a strict sense, but only an outer flank wedge-out of a deep sand on the Port Neches field, which is a deep-seated salt dome. The discovery well had in excess of 250 feet of sand with approximately 150 feet of gas and oil saturation. Active leasing followed this strike, and the near-by Orange field is to be tested for similar possibilities early in 1947.

East Red Fish Reef field in Chambers County might be classified more properly as a new pool in a new fault block on the Red Fish Reef structure. Regardless of its classification, it is an important discovery.

The discoveries at Glendale in Trinity County, and at Madisonville in Madison County, are important in that they have added a new objective—the Edwards limestone of Lower Cretaceous age—for prospecting in the upper part of the area. To date only one well has been completed in each field.

The Sam Houston field in Walker County is the first commercial production in that county. Production is from the upper sands in the Yegua of Eocene age. At the close of the year 3 wells were producing on the pump, 3 were dry holes, and 4 were in the process of completion.

EXTENSIONS AND NEW SANDS

A list of the new pools, or new sands discovered in known fields is shown in Table II. In Table III are listed all important extensions to known pools. The locations of these new sands and extensions are shown in Figure 1.

Approximately 20 per cent of the discoveries listed in Tables II and III were drilled on piercement-type salt domes, while the faulted and low-relief structures accounted for the balance. The new pools and extensions accounted for the greater part of the new reserves added in 1946.

EXPLORATORY METHODS

Of the 121 new-field wildcats drilled in 1946, 30.5 per cent were drilled on seismic prospects; 32.2 per cent were drilled on seismic and subsurface prospects, while subsurface, gravity, geochemical, and core-drill prospects accounted for 37.3 per cent. One out of 9 new-field wildcats was productive. Reflection-seismograph operations showed a decline of 5 per cent in crew weeks as compared with 1945. Gravity exploration showed a decline of 32 per cent as compared with 1945.

Two interesting deeper-pool tests were drilled during the year. Both tested pronounced structures for Wilcox production.

At Raccoon Bend in Austin County, the Humble Oil and Refining Company's L. R. Sherrod No. Y-16, near the crest of the dome, was drilled to 11,447 feet. Crystalline salt was encountered at 11,440 feet. The salt was overlain by 110 feet of chalk containing a Cretaceous fauna similar to that found in marl and

chalk cap rock at South Liberty in Liberty County, and at McFaddin Beach in Jefferson County. This is the deepest salt found on a dome in Texas.

At Tom Ball in Harris County, the Humble Oil and Refining Company's Edward F. Milo No. 10, in the southeast part of the field, was drilled 15,459 feet The top of the Wilcox formation was at 8,489 feet, and the well was still in this formation at the total depth, a penetration of 6,970 feet. The Wilcox section was composed of shale and hard sands with a very low permeability. A few minor gas shows were encountered in the sands. The well was plugged back and completed as a gas-condensate producer in a Yegua sand at 6,146–59, which is approximately 600 feet below the regular oil-producing sands of the field.

At the close of the year, the Sun Oil Company's J. A. Fannin No. 1 wildcat, 2½ miles west of the town of Madisonville, Madison County, was drilling at 2,900 feet in limestone which was thought to be salt-dome cap rock.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 31, NO. 6 (JUNE, 1947), PP. 1078-1083, 1 FIG.

DEVELOPMENTS IN LOUISIANA GULF COAST IN 1946[1]

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ABSTRACT

The 684 completions in 1946 in South Louisiana showed an increase of 11.54 per cent over 1945. Seventy-nine (11.55 per cent) were wildcats, 15 (19 per cent) of which discovered new fields, including Queen Bess Island, Jefferson Parish, a 1945–46 year-end discovery not included in 1945 data. Of the new fields, 8 are oil, 2 are dry gas, and 5 are gas-condensate. Four of the new oil fields are in Beauregard Parish.

On old producing structures, 513 new wells were completed and 92 old wells were plugged back from other formations or drilled deeper. Eighty-seven (94.57 per cent) of the work-overs were successful, 7 of which discovered new sands. Seventy-five of the new wells were drilled as field wildcats, 22 (29.3 per cent) of which resulted in the discovery of new sands or field extensions, distributed in more than 30 different fields, and 46 were dry holes. Seventy-five per cent of the development wells were successful, with 113 dry and abandoned.

In 1946, the Week's Island field, Iberia Parish, was reclassified from a gas-distillate field to an oil field. A major westward extension of Tuscaloosa sand production resulted from the Union Producing Company's Belgard No. 1 completion in Big Island field, Rapides Parish. Deep-drilling conditions of South Louisiana attracted wide attention when the world's record for deep production was established in Week's Island field where the Shell Oil Company completed Smith No. 1 through perforations at 13,763–13,778 feet.

1946 DISCOVERIES

The following are the fifteen discovery wells of 1946 in South Louisiana.

Oil Field	*Parish*		*Total Depth (Feet) and Completion Date*
South Oberlin	Allen	Humble Oil & Rfg. Co. Mrs. J. A. Bell 1-B	13,150 2-19-46
Bear Head Creek	Beauregard	Magnolia Pet. Co. Powell Lbr. Co. 1	8,900 6-22-46
Longville	Beauregard	Barnsdall Oil Co. Long Bell 1	8,430 12-11-46
North Oretta	Beauregard	Magnolia Pet. Co. M. J. Witzki 1	8,969 1-29-46
Singer	Beauregard	Magnolia Pet. Co. Lutcher-Moore 2-C	11,625 1-29-46
Bayou de Fleur	Jefferson-Plaquemines	The California Co. E. P. Brady 1	10,680 3-13-46
Little Temple	LaFourche	Humble Oil & Rfg. Co. La. Delta Farms 1	12,007 4-19-46
Hahnville	St. Charles	Union Oil Co. of Cal. Milliken & Farwell 1	9,981 2-20-46
Gas-Condensate Field			
Bayou Choupique	Calcasieu	Union Sulphur Eugene Ellender 1	10,037 9-14-46
Alliance	Plaquemines	The California Co. 4 E. P. Brady Lse.	14,187 10-14-46

[1] Manuscript received, March 20, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

[2] Consulting geologist.

Oil Field	*Parish*		*Total Depth (Feet) and Completion Date*
Swords	St. Landry	Stanolind Oil & Gas Co. Ezeb Guillory 1	9,861 12-30-46
Big Point	St. Tammany	Atlantic Rfg. Co. 1-A State Lse. Lake Pontchartrain 318	11,052 9-23-46
Queen Bess Island	Jefferson	The Texas Co. 1 State Lse. 356	14,490 12-31-45 (1-3-46)
Johnson's Bayou	Cameron	Continental-Yegua Cameron Ph. School Board 1	9,303 4-12-46
South Shuteston	St. Landry	Sun Oil Co. Mrs. A. M. Darby 1	10,130 7- 8-46

The Little Temple field, LaFourche Parish, has already been abandoned, the small reserves having been depleted by the discovery well. Two attempts to extend production resulted in dry holes. The Swords Field, St. Landry Parish, is considered by some geologists as a structural extension of the Bayou Mallet field rather than a new field on a separate structure. Likewise, the South Shuteston discovery in St. Landry Parish may be considered a structural extension of the Shuteston field rather than a new discovery. The Queen Bess Island field is here listed as a 1946 discovery as it was not included in the 1945 development paper.

IMPORTANT NEW RESERVES

Nineteen Hundred and Forty Six was not an outstanding year for South Louisiana in spite of the large number of wells drilled and worked over. Major reservoir additions were recorded in only four fields. The Weeks Island field, Iberia Parish, not only had large new reserves proved, but gave added impetus to flank drilling on piercement salt domes. The Bayou de Fleur field, a 1946 discovery in Jefferson and Plaquemines parishes, may be considered a major contribution to the reserves of the state, with two new sands opened since its discovery. Development drilling in the Vinton field, Calcasieu Parish, gave the field an extension of reserves of major proportions. The gas reserves in the Lirette field, Terrebonne Parish, were greatly augmented as a result of development in 1946.

FIELD EXTENSIONS

Field extensions or production in hitherto unproved fault segments were made during the year, by both new wells and work-overs, in the following fields

Field	*Parish*	*Field*	*Parish*
North Richie-North Tepetate	Acadia	West Cote Blanche Bay	St. Mary
Bayou des Glaises	Iberville	Dog Lake	Terrebonne
Lafitte	Jefferson	Lake Barre	Terrebonne
Delta Farms	LaFourche	Lapeyrouse	Terrebonne
Plumb Bob	St. Martin	Lirette	Terrebonne
Bayou Sale-Horseshoe Bayou	St. Mary		

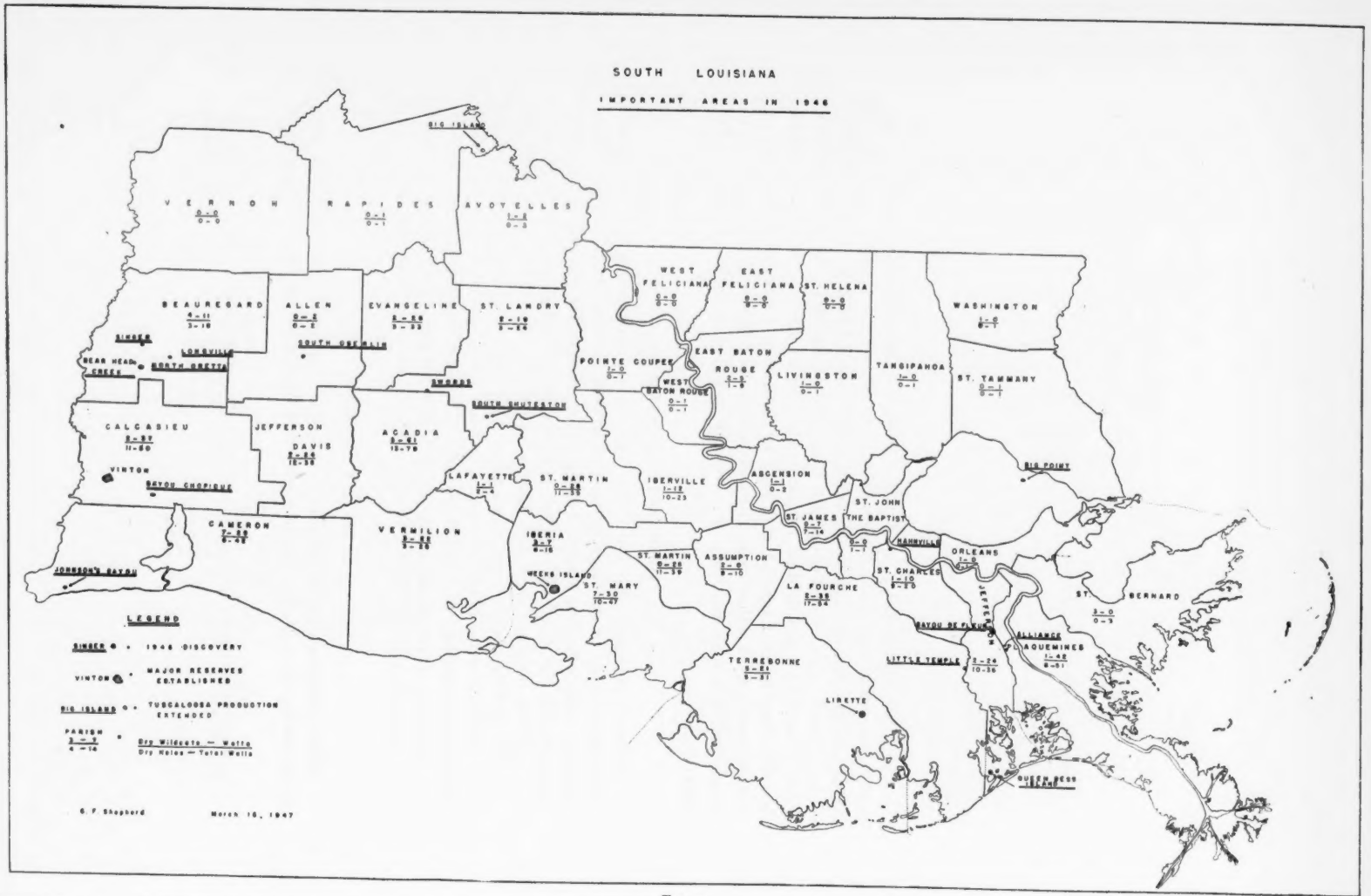
SOUTH LOUISIANA
IMPORTANT AREAS IN 1946
VERNON
RAPIDES
AVOYELLES
BEAUREGARD
ALLEN
EVANGELINE
ST. LANDRY
SINGER
LONGVILLE
BEAR HEAD CREEK
SOUTH GRETNA
SOUTH GREMAIN
ENGLES
SOUTH SHUTESTON
CALCASIEU
JEFFERSON DAVIS
ACADIA
VINTON
BAYOU CHOPIQUE
LAFAYETTE
ST. MARTIN
IBERVILLE
CAMERON
VERMILION
IBERIA
JOHNSON'S BAYOU
WEEKS ISLAND
ST. MARY
ST. MARTIN
ASSUMPTION
LA FOURCHE
TERREBONNE
LIBERTE
WEST FELICIANA
EAST FELICIANA
ST. HELENA
WASHINGTON
POINTE COUPEE
WEST BATON ROUGE
EAST BATON ROUGE
LIVINGSTON
TANGIPAHOA
ST. TAMMANY
ASCENSION
ST. JAMES
ST. JOHN THE BAPTIST
HAHNVILLE
ORLEANS
ST. CHARLES
JEFFERSON
BAYOU DE FLEUR
ST. BERNARD
ALLIANCE
AQUEMINES
LITTLE TEMPLE
BIG POINT
QUEEN BESS ISLAND
LEGEND
SINGER • 1946 DISCOVERY
VINTON • MAJOR RESERVES ESTABLISHED
BIG ISLAND • TUSCALOOSA PRODUCTION EXTENDED
PARISH
Dry Wildcats — Wells
Dry Holes — Total Wells
G. F. Shepherd
March 15, 1947

FIG. 1

NEW SANDS

New sands produced in 1946 in the following fields.

Field	*Parish*	*Field*	*Parish*
Bayou Mallet	Acadia	Bayou Perot	Jefferson
Egan	Acadia	South Jennings	Jefferson Davis
North Crowley	Acadia	South Roanoke	Jefferson Davis
North Richie-North Tepetate	Acadia	North Cankton	Lafayette and St. Landry
Oretta	Beauregard	Alliance	Plaquemines
Iowa	Calcasieu	Stella	Plaquemines
Cameron Meadows	Cameron	Venice	Plaquemines
Mamou	Evangeline	Plumb Bob	St. Martin
New Iberia	Iberia	St. Martinville	St. Martin
Weeks Island	Iberia	Belle Isle	St. Mary
Bayou Blue	Iberville	Caillou Island	Terrebonne
St. Gabriel	Iberville	Lirette	Terrebonne
Bayou de Fleur	Jefferson and Plaquemines	East White Lake	Vermilion

TUSCALOOSA PRODUCTION EXTENDED

In general, new sands or field extensions are of local or operator interest and seldom contribute to geological knowledge which aids in exploration thinking. Wells which open a new trend or extend production of a formation into new territory have a much greater significance from this standpoint. One such well, completed in 1946 in South Louisiana, was the Union Producing Company's H. G. Belgard No. 1 in the Big Island field, Rapides Parish. This well extended Lower Tuscaloosa production 42 miles southwest from the Carthage Point field, Adams County, Mississippi, where this formation yields gas. The nearest prior production in Louisiana from this formation is at the Lake St. John field, Concordia Parish. The Tuscaloosa production in the Big Island field opens a large territory for exploration, not only between this field and the previous production on the east, but also westward across south-central Louisiana.

PROBLEMS OF SOUTH LOUISIANA DRILLING

Activity in 1946 continued to show that South Louisiana is a territory for major companies or large companies with great financial backing. Five hundred seventy-three (83.8%) of the wells and work-overs completed last year were by major companies, and many of the wells drilled by small companies and independents received financial assistance from major companies in bottom-hole or dry-hole contributions.

The great depth to which wells are drilled in this area is one of the reasons for the foregoing. The world's record for deepest production was established in 1946 at the Weeks Island field, Iberia Parish, where the Shell Oil Company's Smith-State No. 2, drilled to 14,301 feet, was completed through perforations at 13,762–13,778 feet. Of the 684 new wells and work-overs, only 72 (10.5%) were drilled to depths less than 5,000 feet and 325 (47.5%) were bottomed between 5,000 and 10,000 feet, and 287 (42%) were drilled to depths between 10,000 and 15,000 feet. This trend in deep drilling is perhaps best indicated by the depths of the new discoveries, as shown in the following table.

Depth (Feet)	No. of Wells	Percentage of Total	No. of Field Discoveries
0– 1,000	2	.3	0
1,000– 2,000	11	1.6	0
2,000– 3,000	35	5.1	0
3,000– 4,000	13	1.9	0
4,000– 5,000	11	1.6	0
5,000– 6,000	32	4.7	0
6,000– 7,000	18	2.6	0
7,000– 8,000	46	6.7	0
8,000– 9,000	93	13.6	3
9,000–10,000	136	19.9	3
10,000–11,000	159	23.2	3
11,000–12,000	71	10.4	2
12,000–13,000	37	5.4	1
13,000–14,000	14	2.0	1
14,000–15,000	6	.9	2
	684	99.9	15

The total footage drilled, including the total depth of work-overs, was 6,138,387 feet, or an average of 8,970 feet per well. This does not include the footage drilled in the many side-tracked holes which were drilled prior to the final completion of many of the wells. Of the foregoing total, 2,030,017 feet (33%) resulted in dry holes, being an average of 9,103 feet per dry hole for the 223 (32.6%) abandonments.

The great depth of many of the wells drilled in South Louisiana is only one of the reasons why this is major-company territory. Geologically, the deep-seated salt domes are extremely complicated structures. In many fields of this type each well can be justly considered a wildcat, as production trends can not be mapped with enough assurance to permit normal development drilling. For example, the Napoleonville field, Assumption Parish, is a proved structure, with small areas of production. During the year, however, 8 wells were drilled, all of which were dry and 2 locations were abandoned. Since the discovery of the Queen Bess Island field in Jefferson Parish the two wells drilled were dry holes, 14,577 feet and 11,807 feet deep. The same is true of the Little Temple field in LaFourche Parish; and in the Delta Duck Club field, Plaquemines Parish, 6 wells were drilled, 5 of which were dry holes, and 2 locations were abandoned. All three wells drilled this year in the Bayou Couba field, St. Charles Parish, were dry holes. Three out of 4 wells drilled in the South Jeanerette field, St. Mary Parish, were dry.

Not only is the structure of salt-dome fields very complicated, but because of the very steep dips of the beds, tilted up by the salt plugs, the sand sections are very thin, resulting in extremely narrow bands of production on the surface. Many wells must be sidetracked, commonly several times, in an attempt to find production, and such operations are extremely expensive.

In contrast to the large percentage of dry holes on proved structures may be cited the Egan field, Acadia Parish, where 26 new wells were drilled with only 3 dry holes; North Richie and North Tepetate fields with 9 of 10 wells successful; Iowa field, Calcasieu Parish, where only 1 of 10 operations was abandoned; Vinton field, in Calcasieu Parish, where 21 of 23 wells were successful; and Good Hope field, St. Charles Parish, with 1 dry hole of 9 new wells drilled.

Another cause for the high cost of drilling in South Louisiana is the fact that a

large percentage of the wells are water locations requiring either expensive piling or matting, or the locations are reached by dredged canals and the wells drilled from barges. Two hundred fifty (36.5%) of the wells drilled last year were water locations, and in several fields land locations were only possible at the expense of elaborate roads such as at the Good Hope field.

Another example of the expensive type of operations in South Louisiana is noted at the Bayou des Glaises field, Iberville Parish, where the Humble Oil and Refining Company builds an island from which directional holes are drilled to the producing sands. Drilling in this field requires 4 months for completion and the cost of this type of operation well exceeds a $\frac{1}{4}$ million dollars.

The picture is not all black, however, as obviously drilling even under these conditions can be profitable. The saving factor, perhaps, at least as far as salt-dome fields are concerned, is not only the extremely thick oil columns, but also the presence of multiple sands which yield very large per-acre-foot recovery factors for the reservoirs. For example, in the Avery Island field, Iberia Parish, the discovery well was drilled between two dry holes, and two dry holes have been drilled since the discovery and yet the reserves in this field rank in the class of major proportions. Multiple sands and high recovery-per-acre factors are characteristic of many piercement-type salt domes in South Louisiana.

GENERAL

Drilling was distributed evenly throughout the year, with the greatest activity in November. The following table shows the distribution of drilling activity by months.

Month	*Completions*	*Dry Holes*	*Total*
January	42	6	48
February	45	19	64
March	34	25	59
April	45	19	64
May	40	14	54
June	30	18	48
July	35	22	57
August	28	19	47
September	34	21	55
October	46	19	65
November	46	25	71
December	36	16	52
Totals	461	223	684

Eight dual completions were successfully attempted this year, 2 in the Port Barre field, St. Landry Parish, and 6 in the Lake Chicot field, St. Martin Parish.

In anticipation of drilling operations in the gulf of Mexico there has been an unusually large amount of geophysical activity in the open water off the shores of South Louisiana. This type of exploration has taxed the ingenuity of the geophysical instrument manufacturers as well as the technical skill of the operators. Drilling in the Gulf has already begun and more operations of this type are anticipated in the coming year.

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DEVELOPMENTS IN ARKANSAS AND NORTH LOUISIANA IN 1946[1]

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ABSTRACT

In all, 1,000 wells were drilled in the area in 1946. This is a 45% increase in drilling activity over the 1945 total of 692 wells. One hundred seventy-two wildcats were drilled, of which 55 were in Arkansas and 117 in North Louisiana. This is comparable with 34 in Arkansas and 81 in North Louisiana in 1945. Wildcatting thus increased by 50%.

In Arkansas 5 new oil fields and 9 new oil-producing zones in old fields were discovered. North Louisiana had 5 new oil fields, 1 new gas field, 2 new distillate fields, 2 new oil-producing zones in old fields, 1 new gas-producing zone in an old field, and 1 new distillate producing zone in an old field. This is a total of 26 new discoveries.

Subsurface work led to most of the new discoveries. In Arkansas and North Louisiana 61,642,142 barrels of crude oil were produced. This is an increase of 7,372,472 barrels over 1945 figures.

Geophysical activity in Arkansas totaled 470 crew weeks, with the seismograph contributing 333 crew weeks to the total. In North Louisiana crew weeks totaled 1,779, with the seismograph contributing 913 and the gravity meter 859 crew weeks.

INTRODUCTION

The district embraced by this paper includes North Louisiana north of an east-west line across the state from the south boundary of Sabine Parish east to the southern line of Concordia Parish and the entire state of Arkansas. Vernon, Rapides, and Avoyelles parishes are now included with the South Louisiana district. North Arkansas is added for the first time this year. These changes have only a slight effect on the comparative figures for 1946 and previous years.

DEVELOPMENT

In all, 1,000 wells of all classes were drilled in the area in 1946. This is comparable with 692 in 1945 and 547 in 1944. This is an increase of 308 wells. This represents an increase in drilling activity of 45% over 1945.

One hundred seventy-two wildcat wells were drilled in the area in 1946. Of this total, 55 were drilled in Arkansas and 117 in North Louisiana. During the preceding year, 34 wildcats were drilled in Arkansas and 81 in North Louisiana, a total of 115. This is an increase of 50% in wildcatting activity. Table I is a classification of the wells drilled in 1946.

Table II classifies the new discoveries made during 1946.

Table III shows the gross oil production in the area for 1946 with comparative figures for the 2 preceding years. A substantial increase of 7,372,472 barrels of oil produced in the area is to be noted. Most of this increase is due to the great expansion of the Delhi field.

The Delhi field during the year was joined with West Delhi and this in turn with Big Creek. In this paper these fields are treated as a unit and termed the

[1] Presented by title before the Association at Los Angeles, March 24–27, 1947. Manuscript received, April 29, 1947.

[2] The Texas Company.

Delhi field. This field (1944 discovery) is one of the major strikes of this area and it now extends from Sec. 11, T. 16 N., R. 7 E., northeast to Sec. 15, T. 17 N., R. 10 E., a distance of 17½ miles. The width varies from ¾ mile to 2¼ miles. The main part of the field lies in Richland Parish. The field is not a structural fold but a

TABLE I

NUMBER OF WELLS AND TOTAL FEET DRILLED IN 1946

	Arkansas		*North Louisiana*		*Total*	
	No.	*Feet*	*No.*	*Feet*	*No.*	*Feet*
Oil wells	111	455,456	423	1,500,592	534	1,956,048
Gas and distillate wells	7	43 811	126	622,055	133	665,866
Dry holes—fields	25	94,157	136	475,966	161	570,123
Dry holes—wildcats	55	215,591	117	587,878	172	803,469
Total	198	809,015	802	3,186,506	1,000	3,995,506

TABLE II

CLASSIFICATION OF 1946 DISCOVERIES IN ARKANSAS AND NORTH LOUISIANA

State	*New Oil Field*	*New Gas Field*	*New Distillate Field*	*New Oil Prod. Zone in Old Field*	*New Gas Prod. Zone in Old Field*	*New Distillate Prod. Zone in Old Field*
Arkansas	5	0	0	9	0	0
North Louisiana	5	1	2	2	1	1
Total	10	1	2	11	1	1

TABLE III

BARRELS OF OIL PRODUCED

State	*1944*	*1945*	*1946*
Arkansas	29,312,020	28,547,400	28,364,872
North Louisiana	26,569,565	25,722,270	33,277,270
Total	55,881,585	54,269,670	61,642,142

stratigraphic trap along the south flank of the Monroe uplift. During 1946 production was extended into Franklin and Madison parishes. During the year, 200 oil wells and 21 gas wells were added to the field. This is double the number of oil wells completed in 1945. The 1946 production of the field amounted to 6,427,325 barrels and the daily production reached 26,000 barrels by the end of 1946.

The daily average production of North Louisiana on January 1, 1946, was 78,000 barrels. At the end of 1946 a daily average production of 100,000 barrels was attained.

Tables IV–VII provide a classification of all wells drilled in the area by counties and parishes and list the total footage drilled.

Table IV shows that 89 of the total of 118 producing wells in Arkansas were drilled in Columbia and Ouachita counties. In Columbia County 13 producers were added to the Village field and 11 to the Stephens field. In Ouachita County 40 oil wells were drilled in the Wesson field and 10 in the Gum Creek field. The Wesson field was by far the most active in the state.

TABLE IV

Producing Wells Completed in Arkansas in 1946

County	Oil Wells	Feet Drilled	Gas and Distillate Wells	Feet Drilled	Total Producing Wells Drilled	Total Footage-Producing Wells
Columbia	31*	177,437	3	23,763	34	201,200
Franklin			2	9,134	2	9,134
Lafayette	8	49,147			8	49,147
Miller			1	7,399	1	7,399
Nevada	7	16,255			7	16,255
Ouachita	54	173,292	1	3,515	55	176,807
Union	11	39,325			11	39,325
Total	111	455,456	7	43,811	118	499,267

* Includes 2 wells deepened.

TABLE V

Producing Wells Completed in North Louisiana in 1946

Parish	Oil Wells	Feet Drilled	Gas and Distillate Wells	Feet Drilled	Total Producing Wells	Total Footage-Producing Wells
Bienville			12	92,848	12	92,848
Bossier	8	36,288	9	52,585	17	88,873
Caddo	111	193,977	8	39,543	119	233,520
Caldwell			3	24,600	3	24,600
Catahoula	1	5,564	1	8,581	2	14,145
Claiborne	17	108,274	15*	103,805	32	212,079
Concordia	22	210,751	1	12,847**	23	223,598
De Soto	8	22,144	2	13,524	10	35,668
Franklin	24	82,720	6	28,220	30	110,940
Grant	1	1,606			1	1,606
Jackson			1	10,368	1	10,368
La Salle	16	32,668			16	32,668
Lincoln			4	35,241	4	35,241
Madison	19	64,388			19	64,388
Morehouse			2	4,395	2	4,395
Natchitoches	4	13,189			4	13,189
Red River	3	7,280	1	3,520	4	10,800
Richland	158	522,440	15	46,882	173	569,322
Sabine	10	29,686			10	29,686
Tensas	14	128,512	2	19,648	16	148,160
Union			39	86,192	39	86,192
Webster	7	41,105	5	39,256	12	80,361
Total	423	1,500,592	126	622,055	549	2,122,647

* Included 1 oil-distillate dual completion.
** Plug-back depth 8,830 feet.

TABLE VI

Dry Holes Drilled in Fields, 1946

County or Parish	No.	Feet Drilled	County or Parish	No.	Feet Drilled
			ARKANSAS		
Columbia	3	17,200	Ouachita	7	26,022
Lafayette	1	4,275	Pope	1	2,550
Miller	4	13,775	Union	4	14,782
Nevada	5*	15,553			
			Total	25	94,157
			NORTH LOUISIANA		
Bienville	7	33,379	Morehouse	2	10,225
Bossier	15	41,046	Natchitoches	3	9,097
Caddo	15*	34,425	Red River	9	22,453
Claiborne	6	35,892	Richland	33	111,876
De Soto	10	28,673	Sabine	10*	25,508
Franklin	12	47,118	Tensas	2	10,563
Grant	2	5,926	Webster	2	11,648
La Salle	6	20,274			
Lincoln	2	17,963	Total	136	475,966

* Includes 1 deepening.

Table V shows that the most active parishes in North Louisiana relative to completed producing wells were Richland, Caddo, Union, Claiborne, Franklin, and Concordia. All the producing wells in Richland and Franklin parishes were in the Delhi producing area. In Caddo Parish 73 Annona chalk producers were added in the Pine Island-Oil City area of the Caddo field (T. 20 N., R. 15 and 16

TABLE VII

WILDCAT DRY HOLES, 1946

County or Parish	*No.*	*Feet Drilled*	*County or Parish*	*No.*	*Feet Drilled*
		ARKANSAS			
Arkansas	1	2,540	Little River	5	15,762
Ashley	1	4,548	Logan	1	6,525
Boone	1	708	Lonoke	1	1,765
Bradley	1	5,011	Miller	4	18,642
Calhoun	2	5,862	Prairie	1	3,163
Chicot	1	6,125	Nevada	4	18,902
Columbia	2	16,161	Ouachita	16	53,311
Desha	1	4,881	St. Francis	1	3,294
Drew	2	9,248	Union	7*	29,060
Dallas	1	2,363			
Lafayette	2	7,720	Total	55	215,591
		NORTH LOUISIANA			
Bossier	9	34,593	Morehouse	4	18,732
Caddo	10	43,376	Natchitoches	3	18,037
Caldwell	1	7,199	Ouachita	3	15,855
Claiborne	2	11,425	Red River	3	12,068
Concordia	1	10,602	Richland	26*	103,280
De Soto	6*	26,349	Sabine	11	58,165
Franklin	14*	83,270	Tensas	3	25,848
Grant	1	1,714	West Carroll	1	6,015
La Salle	5	20,664	Winn	2	16,694
Madison	12	64,392			
			Total	117	587,878

* Includes 1 deepening.

W., and T. 21 N., R. 15 W.). The main emphasis for a number of years in this area has been the exploitation of the chalk zone. Initials are commonly small but this shallow production is generally profitable.

In Union Parish the 39 gas completions were in the Monroe gas field. In Claiborne Parish the main field development centered in the East Haynesville field, in which 14 Rodessa and Pettit producers were completed, and in North Lisbon where 10 Hosston and Cotton Valley wells were drilled.

In the deep Lake St. John field of Concordia and Tensas parishes 38 oil wells were completed in the Massive sand of the Tuscaloosa and 1 distillate well in the upper Tuscaloosa.

Table VIII is a tabulation of the new discoveries in Arkansas and North Louisiana in 1946, and Table IX lists the wildcats drilled in the area.

NEW DISCOVERIES

New oil fields.—Five new oil fields were discovered in Arkansas during the year. These include East McNeil in Columbia County, Spirit Lake and West

TABLE VIII

NEW DISCOVERIES FOR ARKANSAS AND NORTH LOUISIANA DURING 1946

OPERATOR	FARM	COUNTY OR PARISH	LOCATION Check	LOCATION Sec.Twp.Rng.	DEPTH PRODUCING ZONE	PRODUCING FORMATION	INITIAL PRODUCTION	DATE COMPLETED	REASON FOR DRILLING	REMARKS	FIELD NAME	NO. PROD WELLS ON 1-1-47
				ARKANSAS								
J. R. Hayden	Dean 1	Columbia	NW NW	15-16S-22W	4648	Hosston	238 bbl oil	12-24-46	Pool Well	New Producing Formation	Buckner	1
Atlas Oil & Ref. Co.	R. A. Wynns 1	Columbia	SW SW	8-16S-19W	3500	Lower Glen Rose (Pettit)	88 bbl fluid 50% SW	11-5-46	Subsurface	Discovery	East McNeil	1
E.G. Bradham et al	Tena Crumpler 1	Columbia	NW NW	15-17S-19W	5565 6685 (Dual Completion)	Cotton Valley	Upper Sd: 100 bbls oil Lower Sd: 116 bbls oil	6-18-46	Pool Well	New Producing Formation	Village	4
McAlester Fuel Oil Co.	Harris D-1	Columbia	NE SE	9-17S-19W	4470	Hosston	137 bbl oil	11-15-46	Pool Well	New Producing Formation	Village	3
McAlester Fuel Oil Co.	Adams Est. A-1	Lafayette	SW NW	16-16S-24W	3977	Lower Glen Rose (Rodessa)	206 bbl fluid, 18% Salt Water	10-3-46	Subsurface	Discovery	West Lewisville	1
Austin E. Stewart et al	H. Moore Est. 1	Lafayette	NW SE	14-16S-25W	4108	Lower Glen Rose (Kilpatrick Lm)	250 bbl oil	7-30-46	Subsurface Core Drill	Discovery	Spirit Lake	3
Skelly Oil Co	Bodcaw 2	Lafayette	NE NE	19-16S-23W	3210	Upper Glen Rose	82 bbl fluid, 32% BS&W, 6% Salt Water	12-11-46	Pool Well	New Producing Formation	Lewisville-Stamps	1
C.F. Steele	H. L. Waters 1	Nevada	N/2 NW NE	20-14S-21W	1207	Nacatoch	20 bbl oil, 80 bbl Salt Water	5-9-46	Subsurface	Discovery	Willisville	1
Joe Mucher, Tr.	Josie Smith 1	Ouachita	NE SE SW	30-15S-17W	2758	Hosston	45 bbl fluid, 85% oil	9-18-46	Subsurface	Discovery	Pace City	1
McAlester Fuel Oil Co.	Wesson B-2	Ouachita	NE SE NW	24-15S-19W	3486	Hosston	101 bbl oil	2-1-46	Subsurface	New Producing Formation	Wesson	6
Lechner & Hill	R.W. Wesson 1	Ouachita	NE NE NE	25-15S-19W	2890	James Lime	65 bbl oil	6-9-46	Subsurface	New Producing Formation	Wesson	3
McAlester Fuel Oil Co	R.W.Wesson D-1	Ouachita	SE NE SE	24-15S-19W	3732	Hosston	300 bbl oil	8-8-46	Subsurface	Deeper Producing Formation	Wesson	1
McAlester Fuel Oil Co	R.B. Allen A-3	Ouachita	SE SW NE	24-15S-19W	2486	Tokio	22 bbl oil	7-8-46	Subsurface	New Producing Formation	Wesson	1

McAlester Fuel Oil Co	R.W.Wesson D-1	Ouachita	SE NE SE	24-15S-19W	3732	Hosston	300 bbl oil	8-8-46	Subsurface	Deeper Producing Formation	Wesson	1
McAlester Fuel Oil Co	R.B. Allen A-3	Ouachita	SE SW NE	24-15S-19W	2486	Tokio	22 bbl oil	7-8-46	Subsurface	New Producing Formation	Wesson	1
McAlester Fuel Oil Co.	C.M. Wesson D-3	Ouachita	SE SW NW	24-15S-19W	1531	Nacatoch	119 bbl fluid, 10% Salt Water	9-7-46	Subsurface	New Producing Formation	Wesson	1
T. W. Lee	Foster 1	Ouachita	SW NW SW	19-15S-18W	3648	Upper Glen Rose	18 bbl oil	10-1-46	Subsurface	New Producing Formation	Wesson	1
Atlantic Ref. Co.	H. R. F. Goode 1	Union	SW NE NW	6-17S-13W	5637	Smackover Lime	130 bbl fluid, 26% oil	2-10-46	Subsurface Seismograph	New Producing Formation	Rainbow City	1
						LOUISIANA						
Barnsdall-Sohio	Carter-Burton 1	Bossier	NW NW	26-23N-13W	3228	Tokio	54 bbl oil	10-2-46	Gravimeter Seismograph	Discovery	Plain Dealing	1
Union Prod. Co.	Noel Est. A-1	Caddo	SW SW	11-19N-16W	5697	Hosston	8 bbl oil, 7 bbl SW, Gas lift	4-8-46	Subsurface	New Producing Formation	Moorings-port	1
Ohio Oil Co.	Bond-Beene Unit H-1	Claiborne	SE NW	22-23N-8W	9943	Smackover Lime	435 bbl oil 19 hr	4-13-46	Deep test old field	New Producing Formation	Haynesville	2
Kerr-McGee	Nabors 1	De Soto	SW SE	28-12N-14W	6180	Lower Glen Rose (Pettit)	92 bbl distillate	7-26-46	Subsurface	New Producing formation	Spider	1
Sohio Pet. Co	Ayer Timber 1	Franklin	NW SW NW	26-14N-9E	6572	Tuscaloosa	4150 MCF gas plus est 15 bbl dist per MCF	11-15-46	Core Drill Seismograph	Discovery	Killens Ferry	1
Atlas & Sharp	Baker 1	Franklin	SE SE	27-16N-9E	4882	Tuscaloosa	10,000 MCF gas	1-5-46	Pool Well	First Gas Well in Field	Lamar	1
Gus Primos & C. W. Sharp	Butler 1	Franklin	SW NW	20-16N-8E	3524	Paluxy	65 bbl oil	1-19-46	Subsurface	Discovery	South Big Creek	4
California Company	I. R. Richards 1	Lincoln	C NW SE	11-18N-2W	9097	Cotton Valley	211 bbl distillate	4-18-46	Seismograph	Discovery	Choudrant	1
M. T. Halbouty	C. L. Detro 1	Natchitoches	NW SE	1-13N-8W	3288	Lewisville	102 bbl oil	1-6-46	Seismograph	Discovery	Ashland	4
M. T. Halbouty	W. Savill 1	Red River	SW NE	36-11N-10W	1214	Nacatoch	8 bbl oil	7-25-46	Subsurface	Discovery	Lake End	1
R. T. Sellers et al	Burke 1	Richland	SW SE SW	4-16N-7E	2540	Tuscaloosa	30,000 MCF gas	6-20-46	Trend Drilling	Discovery	Dehlco	3
McDaniel Bros.	La. Long Leaf Lbr. Co. 1	Sabine	NW SE NE	33-6N-12W	1398	Wilcox	9 bbl oil plus 4 bbl SW	6-7-46	Subsurface	Discovery	Negreet	1

TABLE IX

IMPORTANT WILDCATS AND DRY HOLES

COMPLETED IN ARKANSAS & NORTH LOUISIANA DURING 1946

OPERATOR	FARM	COUNTY OR PARISH	Location Check	Location Sec.Twp.Rng.	TOTAL DEPTH (FEET)	DEEPEST FORMATION PENETRATED	RESULTS	DATE COMPLETED
			ARKANSAS					
C. E. Osborne	Stuttgart-Trice 1	Arkansas	NE SW	16-2S-3W	2540	No Info	D & A	2-1-46
Albert Plummer	Crossett Lumber 1	Ashley	NE NE	25-17S-6W	4548	No Info	D & A	12-30-46
W. S. King	B. S. Lee 1	Boone	NE NE	24-18N-22W	708	Prob Paleozoic	D & A	2-8-46
Am. Liberty	Bradley Lumber 1	Bradley	NE NE SW	15-13S-9W	5011	Eagle Mills	D & A	7-22-46
Jack Carnes et al	A. Burks 1	Calhoun	NW SW SE	25-13S-16W	3141	Eagle Mills	D & A	12-17-46
E. C. Johnson et al	Freeman-Smith 1	Calhoun	530'W,265'S NE/c NE NW	27-14S-15S	2731	Tokio	D & A	6-24-46
W. O. White et al	Geo. Hudson 1	Chicot	NE NW	8-16S-1W	6125	Smackover	D & A	9-6-46
Atlas Oil & Ref. Co.	Longino 1	Columbia	NW NW SE	34-17S-23W	9313	Smackover	D & A	12-1-46
McAlester Fuel Co.	Russ 1	Columbia	SW SW	12-16S-20W	6848	Smackover	D & A	4-21-46
Lion Oil Co.	Bickham 1	Desha	NW SW	35-10S-3W	4881	Eagle Mills	D & A	9-8-46
Curtis Kinard et al	Reinhart 1	Drew	NE SW	22-13S-6W	4191	Basal U. Cretaceous ?	D & A	7-25-46
C. A. Kinard	McCauley 1	Drew	NE SW	14-12S-6W	5057	Paleozoic	D & A	6-18-46
W. S. Poole et al	Southern Co. & Sturgis Bros. 1	Dallas	SW SE NE	26-9S-16W	2363	Prob. Paleozoic	D & A	5-22-46
Sidney G. Myers	T. C. Short 1	Lafayette	34-15S-24W	NE SE SE	4015	Rodessa (Kilpatrick Ls)	D & A	11-27-46
Ray-Woolf	Wade Kitchens 1	Lafayette	SE NW SE	17-15S-22W	3705	Hosston	D & A	10-4-46
K. E. Merren et al	D. K. Lewis 1	Little River	NW SW	1-13S-31W	3004	Hosston	D & A	11-23-46
R. A. Mason et al	H. Troth 1	Little River	NE SW	3-14S-28W	3506	Lower Glen Rose	D & A	12-21-46
John F. Rippy	Billingsley 1	Little River	SW SE	9-10S-32W	425	No Info	D & A	9-6-46
Ark. Okla. Gas Co.	N. C. Biggs 1	Logan	100'W,500'S NE/c NE NW	7-7N-27W	6525	Paleozoic	D & A	6-22-46
G. C. Howeal, Tr.	G. Barnwell 1	Lonoke	400'N,300'E					

G. C. Howeal, Tr.	G. Barnwell 1	Lonoke	400'N,300'E SW/c Sec.	18-4N-9W	1765	No Info	D & A	5-1-46
Garland Anthony et al	A. W. Smith 2	Miller	150'E,250'S NW/c SE	24-15S-26W	4610	Lower Glen Rowe	D & A	2-9-46
The Texas Co.	C. W. Person 1	Miller	NW SE	29-16S-25W	4203	Upper Glen Rose	D & A	3-15-46
J. P. Owen et al	A. Ritenuti	Miller	16-17S-27W	SW NE SE	4024	Paluxy	D & A	12-28-46
C. M. Kerns et al	Lincoln Nat'l Life Ins. Co. 1	Miller	330'S,125'W NE/c NW	15-18S-26W	5805	Ferry Lake Anhydrite	D & A	12-23-46
M. W. Martin et al	W. H. Stewart 1	Prairie	1600'E,2000'E NW/c Sec.	3-3N-5W	3163	No Info	D & A	6-10-46
Placid et al	West 1	Nevada	NW SE NE	19-14S-21W	5439	Smackover	D & A	6-24-46
Spartan Drlg. Co.	J. W. Plumby 1	Nevada	SW SE NE	9-15S-22W	4483	Cotton Valley	D & A	9-15-46
Barnsdall Oil Co.	Stuart 1	Nevada	100'E Cen SW SE	12-14S-23W	5590	Smackover	D & A	9-6-46
R. A. Young et al	Grove L.& T. Co. 1	Nevada	NE SW SE	13-14S-21W	3390	Hosston	D & A.	12-26-46
Jack Carnes et al	Myar Bros. 2	Ouachita	SW SW SE	14-13S-19W	2611	Hosston	D & A	11-13-46
Jack Carnes et al	Myar Est. 1	Ouachita	NE NE SE	24-13S-19W	2400	Hosston	D & A	6-7-46
Joe Mucher et al	Berg Est. 1	Ouachita	NW SE NE	12-14S-18W	2600	Tokio	D & A	6-13-46
Atlas Oil Corp.	L. G. Green 1	Ouachita	SE SW	4-14S-19W	4014	Cotton Valley	D & A	11-9-46
Curtis Kinard	Haltom Est. 1	Ouachita	NW NW NW	4-15S-19W	3660	Hosston	D & A	10-31-46
Root Pet. Co.	C. A. Strong 1	Ouachita	SE NE SW	23-15S-17W	3623	Hosston	D & A	12-30-46
J. W. Coan et al	Werner Saw Mill 1	Ouachita	SE SE SW	28-15S-17W	3514	Hosston	D & A	11-1-46
Lion Chem. Corp.	Curry 1	Ouachita	NW SE SE	33-14S-19W	8140	Brownstown	D & A	7-26-46
Raymond D. Reynolds	Robinson 1	Ouachita	SE SE SE	36-14S-19W	2653	Lower Glen Rose	D & A	8-18-46
Hunt Oil Co.	J. H. Dawson 1	Ouachita	NW NW	14-15S-18W	5780	Smackover	D & A	5-4-46
Paul Mosebach et al	F. S. Foster 1	Ouachita	SW SW NW	20-15S-18W	3740	Ferry Lake	D & A	4-5-46
S. J. Felsenthal	H. H. Medlock 1	Ouachita	SE NE SW	29-15S-18W	3504	Hosston	D & A	5-16-46
C. A. Lee	Morgan 1	Ouachita	SE NE SW	2-15S-19W	2330	Brownstown	D & A	5-29-46
Lion Chem. Corp.	Wesson 1	Ouachita	SW SE NW	4-15S-19W	2405	Lower Glen Rose	D & A	7-12-46

Foster & Green	Campbell 1	Ouachita	NE NE NW	10-15S-19W	4312	Cotton Valley	D & A	5-2-46
Doug Whitaker	Bank of Stephens 1	Ouachita	NW NW SE	16-15S-19W	4025	Hosston	D & A	4-2-46
Coker-Martin-Beals	J. A. Bryan 1	St. Francis	520'N & W SE/c Sec.	17-4N-3E	3294	No Info	D & A	12-11-46
Guy Mabee et al	Union Saw Mill 1	Union	NE SW NW	31-18S-11W	6416	Smackover	D & A	7-21-46
C. A. Kinard	E. P. Hammond 1	Union	NW NE NW	19-17S-15W	3702	Hosston	D & A	2-12-46
Lion Chem. Corp.	Sam 1	Union	SE SW NW	23-18S-15W	3263	Lower Glen Rose	D & A	10-4-46
Kerr-McGee Oil Ind.	Crossett 1	Union	SW SW N W	3-19S-10W	6292*	Smackover	D & A	10-12-46
Wallingsford et al	Citizens Bank 2	Union NE	NE SE NW	13-18S-13W	3569	Hosston	D & A	11-30-46
Lion Chem. Corp.	Zanell 1	Union	NW NE NE	34-18S-13W	2718	Ozan	D & A	12-12-46
L. H. Wentz	M. W. Frutell 1	Union	SW NW	1-17S-17W	3100	Lower Glen Rose	D & A	12-17-46

LOUISIANA

H. C. Owens et al	Skidmore 1	Bossier	NE SE	1-16N-11W	5366	Lower Glen Rose	D & A	3-15-46
C. C. Lowery et al	A. M. Levy 1	Bossier	330'N,1650'W SE/c Sec	7-19N-11W	2310	Lower Cretaceous	D & A	5-2-46
W. O. Weaver et al	Lodwick Lbr. 1	Bossier	2440'S,2540' E NW/c Sec	35-19N-11W	936	Nacatoch	D & A	8-15-46
G. H. Pierce	Levy 1	Bossier	575'N,2080' W SE/c Sec	7-19N-11W	693	Nacatoch	D & A	12-17-46
Big West Drlg Co	Continental Amer. Bank .	Bossier	SW NE	23-19N-11W	5928	Cotton Valley	D & A	1-8-46
L. Potter et al	Dr. L.H. Pirkle 1	Bossier	SE SW	31-19N-12W	3009	Paluxy	D & A	3-18-46
J. B. Blanchard	J.R. Wurtzbaugh 1	Bossier	1672'S,330' E NW/c Sec	35-20N-11W	3762	Prob. Lower Cretaceous	D & A	8-31-46
Barnsdall-Sohio-Continental	Crystal Fee 1	Bossier	SE SW	28-21N-11W	9074	Cotton Valley	D & A	5-4-46
Rowe	Hardy 1	Bossier	NE NE SW	10-23N-13W	3515	Tokio	D & A	12-23-46
Big West	C. L. Ellerbe 1	Caddo	200'S,660' W NE/c Sec	27-15N-12W	9608	Cotton Valley	D & A	1-28-46
W. C. Feazel et al	S. L. Herold 1	Caddo	NW SW	21-15N-16W	6719	Hosston	D & A	8-1-46

Hugh M. Sneed et al	W. L. Simmons 1	Caddo	660'N,1996' E SW/c Sec	15-16N-14W	1211	Nacatoch	D & A	9-28-46
Atlas Oil Corp.	Abe Meyer Corp 1	Caddo	SW SE	17-17N-14W	3510	Paluxy	D & A	12-2-46
Atlas Oil Corp.	Sample 1	Caddo	SW NW	29-17N-14W	3514	Paluxy	D & A	12-20-46
Atlas Oil & Ref. Co.	C. R. Minor 1	Caddo	NE NW	35-17N-16W	3018	Paluxy	D & A	11-2-46
Kerr-McGee Oil Ind. Inc.	Harry Johnson 1	Caddo	500'N,100' W NE/c SW	33-19N-14W	6050	Hosston	D & A	9-15-46
Kirby Pet. Co.	Ledbetter 1	Caddo	1058'N,2310' E SW/c Sec	4-22N-15W	3741	Paluxy	D & A	8-11-46
R. W. Norton, Jr.	Collins 1	Caddo	NE SE	4-22N-15W	3050	Paluxy	D & A	10-18-46
A. Paul Gilbert	Thompson 1	Caddo	1650'S,808' W NE/c Sec	15-22N-16W	2955	Paluxy	D & A	5-27-46
Atlantic	La. Cent. Lbr. Co. E-1	Caldwell	1917'S,625' W NE/c Sec	32-13N-4E	7199	Paluxy	D & A	6-26-46
Union Prod. Co.	Wise 1	Claiborne	NW NE	15-23N-6W	5710	Hosston	D & A	12-29-46
Placid-Union Prod.	Owens-Odom Unit 1	Claiborne	NE NW	21-23N-6W	5715	Hosston	D & A	7-8-46
S. W. Richardson	Madison Oil & Dev. Co. A-1	Concordia	960'S,1980' E NW/c Sec	34-6N-9E	10602	Lower Cretaceous	D & A	3-9-46
Spartan Drlg. Co.	B. F. Thigpen 1	De Soto	NE NW	29-12N-11W	9178	Cotton Valley	D & A	1-22-46
Arthur Brewer et al	H. S. Rogers 1	De Soto	SW NE SE	32-13N-14W	3025	Paluxy	D & A	5-18-46
C. C. Lowery	M. R. Crow 1	De Soto	2800'S,2265' E NW/c Sec	51-11N-10W	1620	Marlbrook	D & A	4-11-46
Delta Drlg. Comp.	Sample 1	De Soto	1990'S,1650' E NW/C Sec	12-13N-14W	6880	Hosston	D & A	6-17-46
Kayser et al	G. B. Dickson 1	De Soto	305'S,2349' W NE/c Sec	23-14N-13W	2836	Prob. Lewisville	D & A	9-20-46
J. P. Owens	D. C. Dickson 1	De Soto	NE NE SW	26-14N-13W	2810	Prob. Lewisville	D & A	10-25-46
Big Chief Drlg. Co.	J. T. Ingram 1	Franklin	SE SE SE	4-13N-6E	5680	Paluxy	D & A	1-31-46
C. H. Murphy, Jr.	Robinson 1	Franklin	SW NW	21-13N-7E	6909	Paluxy	D &A	9-2-46
C. L. Smith et al	T. W. Starks 1	Franklin	SE SW	26-13N-7E	7245	Paluxy	D & A	1-18-46
C. L. Smith	C. A. Polk 1	Franklin	NW SE	27-14N-7E	5787	Paluxy	D & A	3-8-46

Big Chief Drlg. Co.	Mackie Bradley 1	Franklin	SE SE NW	35-14N-8E	6915	Paluxy	D & A	12-13-46
Atlas Ref. Co.	H. B. Cox 1	Franklin	500'E,676' N SW/c NE NW	9-15N-9E	5352	Paluxy	D & A	11-11-46
F. B. King et al	McIntyre-O'brien 1	Franklin	NE NE NE	32-16N-9E	6009	Upper Glen Rose	D & A	4-22-46
F. B. King	Baskin Estate 1	Franklin	SE NW SW	35-16N-7E	4004	Upper Glen Rose	D & A	2-22-46
Am. Liberty	Holt 5	Franklin	788'N,805' W SE/c Sec	14-16N-8E	4256	No Info	D & A	11-12-46
Wadley & Forgotson	Breece Lbr. Co. 1	Franklin	SE SE SW	18-16N-8E	3602	Igneous	D &A	9-26-46
Murphy-Sun	Holt B-1	Franklin	529'N,811' W SE/c NE	32-15N-8E	5128	Upper Glen Rose	D & A	9-7-46
J. M. Hazlewood	Walden-Baker 1	Franklin	190' N Cen NW SW	36-16N-9E	5303	Paluxy	D & A	3-30-46
Big Chief Drlg. Co.	J. S. Ames 1	Franklin	NE NW	2-16N-9E	4300	Paluxy	D & A	3-26-46
Sohio Pet. Co.	L. Rogers 1	Franklin	SW NE	15-16N-9E	4688	Paluxy	D & A	6-16-46
D. H. Williams	H. A. Strong 2	Grant	SE SE	28-9N-1E	1714	Wilcox	D & A	10-18-46
Joe B. Belt et al	Urania Lbr. Co. 1	La Salle	NW NE	3-6N-2E	4514	Wilcox	D & A	5-3-46
Placid Oil Co.	Tremont F-5	La Salle	NW NE	14-9N-2E	7120	No Info	D & A	7-29-46
H. L. Hunt	Goodpine F-46	La Salle	SE NE	30-9N-2E	6545*	Prob. Basal Tuscaloosa	D & A	9-15-46
McElreath & Suggett	Urania Lbr. Co. 1	La Salle	SW SE	3-10N-3E	4161	Midway	D & A	2-12-46
Placid Oil Co.	La. Cent. 123	La Salle	SW SE	20-11N-3E	7324	Prob. Tuscaloosa	D & A	10-31-46
J. L. Youngblood	U. S. D. Agr. 1	Madison	2310'E,330' S NW/c Sec	34-15N-14E	8032	Paluxy	D & A	4-8-46
Atlas Oil Corp.	Yerger 1	Madison	440'N,335' W SE/c Sec	50-16N-14E	8010	Washita-Fredericksburg	D & A	11-9-46
Murphy-Sun	Ashley Plantation 1	Madison	536'N,496' W SE/c Sec	13-17N-10E	4764	Ferry Lake Anhydrite	D & A	10-17-46
Pres Cochrane	J. M. Frazier A-1	Madison	SE NE SW	15-17N-10E	4010	Paluxy	D & A	4-25-46
Atlas Oil Corp.	D. Thompson Unit 1	Madison	SE SW	21-17N-10E	4004	Paluxy	D & A	10-5-46
Rogers Lacy	Bryant 1	Madison	SW SW	28-17N-10E	4209	Paluxy	D & A	6-24-46
Arrow Drlg Co.	E. J. Waller 1	Madison	200'N,300'W SE/c Sec.	16-17N-11E	4007	Paluxy	D & A	8-28-46

Murphy-Sun	L. E. Clark 1	Madison	649'S,1969' W NE/c Sec	17-17N-12E	5809	Ferry Lake Anhydrite	D & A	8-15-46
J. M. Snowden	C. T. MacNeille 1	Madison	NW SE NW	25-17N-13E	4977	Lower Cretaceous	D & A	9-21-46
C. H. Osmond	Anderson-Tully 1	Madison	SE SE	28-17N-14E	7510	Paluxy	D & A	11-16-46
S. W. Richardson	F. Hooten 1	Madison	SW NE	31-18N-12E	4740	Lower Glen Rose	D & A	3-8-46
Vaughey-Vaughey	C. Sledge 1	Madison	NW SW SW	32-18N-12E	4320	Upper Glen Rose	D & A	10-10-46
Atlas Oil Corp.	Mott 1	Morehouse	SW SE	30-19N-7E	4707	Cotton Valley	D & A	10-14-46
Sohio Oil Corp.	McDuffie 1	Morehouse	990'N,2310' W SE/c Sec	32-19N-7E	6672	Cotton Valley	D & A	3-2-46
Pure Oil Co.	Nettie Robinson 1	Morehouse	NE SE	17-23N-8E	3700	Smackover	D & A	7-28-46
The Texas Co.	W. W. Doles 1	Morehouse	SW NW	10-23N-8E	3653	Smackover	D & A	11-15-46
Magnolia Pet. Co.	Union Saw Mill 1	Natchitoches	NW SE	7-6N-6W	9548	Paluxy	D & A	5-3-46
H. J. Schmitz et al	B. Smith 1	Natchitoches	SW NE SW	33-9N-9W	7514	Lower Glen Rose	D & A	7-31-46
Demetrio	Prudential Life Ins. Co. 4	Natchitoches	NE SE	16-10N-9W	1575	Nacatoch	D & A	9-12-46
California Co.	Walker-Maxey 1	Ouachita	SW NE	32-18N-1E	9192	Cotton Valley	D & A	2-10-46
Crescent Drlg. Co.	Feazel & Caldwell 1	Ouachita	1060'N,670' W SE/c Sec	18-18N-1E	3392	Upper Glen Rose	D & A	11-9-46
California Co.	Breece Lbr. 1	Ouachita	NW NE	3-17N-5E	3271	No Info	D & A	12-10-46
M. T. Halbouty	Franklin Realty 1	Red River	1980'N,1865' E SW/c Sec	24-11N-10W	1258	Nacatoch	D & A	7-16-46
Carter Oil Co.	Bell Lumber 1	Red River	NW NE NW	24-13N-10W	4016	Upper Glen Rose	D & A	7-25-46
Ray-Woolf-Hawkins et al	Wilson 1	Red River	2084'S,1980' E NW/c Sec	4-14N-10W	6794	Hosston	D & A	9-4-46
Lion Chemical Corp.	Tensas 1	Richland	NW NW	22-14N-5E	4524	No Info	D & A	9-18-46
Lion Oil Co.	C. D. Williams 1	Richland	SW SE	8-14N-5E	4525	No Info	D & A	7-10-46
Fisher-Hutchings	Tensas Delta Land 1	Richland	NW NE SE	20-14N-6E	5049	Paluxy	D & A	8-7-46
Lewis & Stewart	Noble 1	Richland	NW NW SW	12-15N-5E	4271	Ferry Lake Anhydrite	D & A	12-13-46
Sharp-King et al	Wooten 1	Richland	NE NW NE	36-15N-5E	5142	Upper Glen Rose	D & A	10-19-46
H. G. Lewis	R. R. Rhymes 1	Richland	SW NW SE	8-15N-5E	4218	Paluxy	D & A	3-18-46

Humphry-Wynne	M. B. Boughton 1	Richland	2326'N,1659' E SW/c Sec	1-15N-6E	3606	Paluxy	D & A	8-8-46
A. G. Lewis et al	School Board 1	Richland	SE SW SE	16-15N-6E	4195	Upper Glen Rose	D & A	4-6-46
C. G. Glasscock	L. & E. Hightower 1	Richland	SW SE SE	5-15N-7E	4502	Ferry Lake Anhydrite	D & A	4-1-46
R. T. Sellers	M. E. Clark 1	Richland	SE NE SW	2-16N-7E	2690	Tuscaloosa	D & A	6-21-46
Humphry-Wynne	McCormick 1	Richland	2310'E,990' N SW/c Sec	7-15N-7E	4211	Upper Glen Rose	D & A	8-30-46
Houston-British Am.	E. C. Godfrey 1	Richland	SW SE NW	25-16N-6E	3320	Upper Glen Rose	D & A	10-24-46
Bryant & Caraway	Scott Harrell 1	Richland	SW NW NW	26-16N-7E	3617	Upper Glen Rose	D & A	2-26-46
Humphry-Wynne	M. D. Boughton 1	Richland	NW SW SW	36-16N-6E	3655	Upper Glen Rose	D & A	3-10-46
C. M. Bagley	Greer Estate 1	Richland	SE SW NE	28-16N-7E	3360	Upper Glen Rose	D & A	11-1-46
Cherry-Kid Co.	J. J. Achibald 1	Richland	SE NE NW	29-16N-7E	3420	Ferry Lake Anhydrite	D & A	5-11-46
H. W. Todd	Chandler-Hill 1	Richland	330'N,585'W SE/c Sec	13-16N-7E	3534	Upper Glen Rose	D & A	5-6-46
R. C. Fisher	D. Robinson 1	Richland	SE NE SE	13-17N-7E	3301	No Info	D & A	8-26-46
R. L. Fisher et al	S. F. Cooper 1	Richland	SW NW SE	21-17N-7E	3308	Lower Glen Rose	D & A	11-5-46
Pan-Am. Prod. Co.	G. B. Franklin & Son 1	Richland	2028'S,730' W NE/c Sec	3-17N-8E	4002	Hosston	D & A	7-29-46
G.B. Franklin & Son	Fee 1	Richland	NW SE	14-17N-8E	4471*	No Info	D & A	5-14-46
Big Chief Drlg. Co.	G. B. Franklin 1	Richland	SE SW SE	7-17N-9E	4818	Hosston	D & A	3-10-46
J. A. Goin et al	H. B. Balfour 1	Richland	SW NE SW	22-18N-7E	3520	No Info	D & A	9-16-46
Pan-Am. Prod. Co.	G. B. Franklin 2	Richland	SE SE SE	34-18N-8E	4003	Hosston	D & A	8-15-46
Pan-Am. Prod. Co.	G. B. Franklin 3	Richland	50'SNL,330' WEL of Sec.	34-18N-8E	4002	Hosston	D & A	9-4-46
Homer Hurley et al	Singer Mfg. Co. 1	Richland	NW NW	21-18N-9E	4016	Hosston	D & A	8-20-46
Carter Oil Co.	Pickering Lbr. Co. 1	Sabine	610'N,660'W SE/c SE SW	14-4N-11W	9497	Fredricksburg Lime	D & A	1-20-46
Ben L. Jones et al	J. K. Phares 1	Sabine	860'S,330' E NW/c Sec	9-5N-12W	2425	Midway	D & A	6-7-46
H. J. Kirk et al	Long Bell Lumber Co. 1	Sabine	222'N,1962' W SE/c NE	4-6N-13W	2558	Saratoga	D & A	7-21-46

Carter Oil Co.	La. Long Leaf Lbr. Co. 1	Sabine	SW SW	27-7N-10W	9216	Hosston	D & A	5-31-46
F. R. Reynolds	Sabine Lbr. Co. 1	Sabine	1825'N,1547' W SE/c Sec	31-7N-13W	2930	Ozan	D & A	11-18-46
DeWitt et al	Sabine Lbr. Co. 1	Sabine	3051'N,3350' W SE/c Sec	31-7N-13W	2868	Ozan	D & A	7-26-46
Union Prod. Co.	La. Long Leaf Lbr. Co. 1	Sabine	731'N,629' E SW/c Sec	29-8N-11W	11265	Lower Hosston or Upper Cotton Valley	D & A	7-7-46
Arrow Drlg. Co.	Bauer 1	Sabine	900'N,3100' W NE/c Sec	31-8N-13W	3598	Fredricksburg Lime	D & A	8-2-46
T. L. James Co.	Brown 1	Sabine	NE SW	6-9N-12W	6215	Lower Glen Rose	D & A	2-2-46
Skelly Oil Co.	Whitney Corp. 1	Sabine	SE SE	1-9N-14W	5548	Lower Glen Rose (Rodessa)	D & A	9-1-46
L & L Oil Co.	Pelican State Bank-Burr	Sabine	3040'S,1980' E NW/c Sec	25-10N-13W	2045	Ozan	D & A	4-24-46
Chicago Mill & Lbr. Co.	Mutual A-2	Tensas	4620'S,1972' W NE/c Sec	30-12N-10E	8401	Basal Tuscaloosa	D & A	8-21-46
Sohio Pet. Co.	Biedenharn 1	Tensas	660'N30°34' E, 660'E SW/c Sec	11-12N-12E	9761	Paluxy	D & A	5-20-46
E. C. Johnson	Sawyer 1	Tensas	2150' S76°E NW/c Sec	8-13N-14E	7686	Upper Cretaceous	D & A	1-2-46
Tex & Pacific Coal & Oil	Singer 1	West Carroll	SE SE SW	33-19N-9E	6015	Cotton Valley	D & A	3-1-46
H. L. Hunt	Goodpine F-133	Winn	590'S,520' W NE/c Sec	25-12N-5W	8678	No Info	D & A	9-27-46
H. L. Hunt et al	Goodpine F-134	Winn	1980'N & W SE/c Sec	9-13N-5W	8016	No Info	D & A	12-13-46

* = Old Well Deepened

Lewisville in Lafayette County, Willisville in Nevada County, and Pace City in Ouachita County. The Spirit Lake field had 3 producing wells at the end of the year. The other new discoveries had not progressed beyond the initial well. Production in the Spirit Lake field is from the Kilpatrick limestone at the base of the Ferry Lake anhydrite. East McNeil produces from the Pettit limestone of the lower Glen Rose. Pace City produces 28° gravity oil from a thin sandstone at the top of the Hosston. Willisville production is 15.5° gravity oil from the Nacatoch and West Lewisville production is 37° gravity oil from the Hill zone of the upper Rodessa. It is probable that Spirit Lake and West Lewisville are the most promising of the new fields. All of the new oil discoveries but East McNeil are on closures associated with the South Arkansas fault graben.

There were also 5 new oil fields discovered in North Louisiana during the year. These were the Plain Dealing field in Bossier Parish, South Big Creek in Franklin Parish, Ashland in Natchitoches Parish, Lake End in Red River Parish, and Negreet in Sabine Parish. Ashland and South Big Creek each had 4 producing wells by the end of the year; the other new discoveries each had only one producer. Production in the Plain Dealing field is from the Tokio, the Paluxy produces at South Big Creek, the Lewisville at Ashland, the Nacatoch at Lake End, and the Wilcox at Negreet. Lake End and Negreet are of minor importance.

New gas fields.—No gas discoveries were made in Arkansas during the year. In North Louisiana the Dehlco field in Richland Parish was the only gas discovery. This is 2½ miles west of production in the Big Creek area of the Delhi field. Production is from a sand in the Tuscaloosa near the truncated margin of this formation. Three wells were completed by the end of the year. This reservoir is very probably a stratigraphic trap of the type of the Delhi field.

New distillate fields.—There were no new distillate fields discovered in Arkansas during the year. In North Louisiana two were discovered. The Killens Ferry field in Franklin Parish produces from a thin, broken sand section at the base of the Tuscaloosa and just above the contact with the Lower Cretaceous Fredericksburg limestone. The future extent of this field can not be predicted at this time. The discovery well was the only producer by the end of the year.

The Choudrant distillate field in Lincoln Parish produces from the Bodcaw sand zone of the Cotton Valley formation. The discovery well was the only producer by the end of the year.

New oil-producing zones in old fields.—Nine new formations were added to the productive zones in Arkansas fields during the year and 2 were added in North Louisiana.

In Arkansas the Wesson field in Ouachita County accounted for 6 of the total. The Nacatoch, Tokio, James limestone, two zones in the Hosston, and the Upper Glen Rose were added. All had only a single completion except for the James limestone with 3 producers and the Hosston with 6. In the Rainbow City field of Union County, the Smackover limestone reservoir was opened in the northeast part of the field. It is doubtful if this will cover a large area. The dis-

covery well produced substantial amounts of salt water with 20° gravity oil. Only a single well was completed by the end of 1946. The Lewisville-Stamps field in Lafayette County developed minor amounts of 22° gravity oil in a zone a short distance above the Ferry Lake anhydrite. This zone had one completion during the year. This well was a plug-back of an old Rodessa producer. In the Village field of Columbia County the Cotton Valley and Hosston were added as new producing formations. The only producing formation prior to 1946 was the Smackover limestone. By the end of the year 3 Hosston and 4 Cotton Valley completions had been made. It is believed that both the Hosston and Cotton Valley will become important producers throughout the field and should add materially to the reserves. Near the end of the year Hosston production was obtained in the Buckner field by plugging back an old Smackover limestone producer at the east end of the field. Only one well was completed in this zone by the end of 1946.

In North Louisiana two new oil-producing formations were added. In the shallow Mooringsport gas field in Caddo Parish minor amounts of oil were produced in the Hosston. This well was later abandoned and no additional wells have been drilled. One of the most important developments was the discovery of deep Smackover limestone oil in the Haynesville field. By the end of the year 2 completions had been made in this formation.

New gas-producing zones in old fields.—No new gas formations were discovered in Arkansas. In North Louisiana the Lamar field in Franklin Parish developed gas production from a thin sand just above the basal ("Massive") Tuscaloosa sand zone. Only one well was completed during the year and the future extent of the gas zone can not be predicted.

New distillate-producing zones in old fields.—No new distillate formations were opened in Arkansas. North Louisiana had only one. In the Spider field, De Soto Parish, the Pettit zone of the lower Glen Rose was added to the Rodessa as a producing formation. Only a single completion was recorded for the year.

IMPORTANT NEW FIELDS

Spirit Lake (Lafayette County, Arkansas).—This field is 4 miles west of Lewisville, county seat of Lafayette County. The location for the first well was preceded by subsurface and core-drill work by the Carter Oil Company. The discovery well was the Austin E. Stewart *et al.* H. Moore Estate No. 1, Sec. 14, T. 16 S., R. 25 W. This well was completed on July 30, 1946. A flow of 250 barrels of 36.5° gravity oil was obtained through a 1/16-inch tubing choke, from casing perforations between 4,108 and 4,118 feet and between 4,142 and 4,152 feet. This production is from the Kilpatrick limestone zone at the base of the Ferry Lake anhydrite. The well was drilled to 4,515 feet, penetrating the upper 400 feet of the Rodessa formation. A fault with about 650 feet of displacement was encountered in the Tokio section. The field is on a closure against the south fault of the South Arkansas fault graben. Two additional Kilpatrick limestone wells were added

by the end of 1946. Production in the field will probably be confined to a relatively narrow band adjacent to the fault zone.

West Lewisville (Lafayette County, Arkansas).—This field is 3½ miles due east of the Spirit Lake field and ½ mile west of the town of Lewisville. The discovery well was the McAlester Fuel Oil Company's Adams Estate No. A-1, Sec. 16, T. 16 S., R. 24 W. The well was 550 feet in the Rodessa at the total depth of 4,358 feet. Completion was in the upper Rodessa at approximately the Hill zone. The well was completed on October 3, 1946, and flowed 169 barrels of oil and 37 barrels of salt water from casing perforations between the depths of 3,977 and 3,992 feet. The oil is 37° gravity. Several faults in a vertical zone of 250 feet were encountered with a combined displacement of about 900 feet. A part of the Ferry Lake anhydrite and a part of the Paluxy were cut out. The well is probably located along the same fault zone as the Spirit Lake field. Only the discovery well was completed by the end of the year. This field, like the Spirit Lake field and others of the fault-line fields will probably be narrow. The lateral extent of the production is difficult to assess at this stage of development.

Plain Dealing (Bossier Parish, Louisiana).—This field is 4 miles north of the village of Plain Dealing and 3½ miles south of the Arkansas line in northern Bossier Parish. After a gravity-meter survey followed by seismograph exploration, the Barnsdall Oil Company drilled the Carter Burton No. 1, Sec. 26, T. 23 N., R. 13 W. The well was drilled to 12,386 feet. The Smackover was topped at 10,940 feet (−10,572 feet), the Eagle Mills at 12,330 feet, and the Eagle Mills salt at 12,373 feet. The well was in salt at the total depth. No showings were reported in the Smackover. A drill-stem test in the lower Cotton Valley between 9,665 and 10,035 feet flowed an estimated 16,000 cubic feet of gas and 7½ barrels of 45° gravity oil in 31 hours. This zone was not considered commercial and was squeezed off. Several other sands were tested without result between 7,100 feet and 8,950 feet. A drill-stem test in the Pettit porous zone of the lower Glen Rose from 6,322 to 6,340 feet, after acid, swabbed small amounts of 41° gravity oil and salt water. This was also squeezed off and the final completion made in the Tokio. Casing perforations from 3,228 to 3,265 feet pumped 54 barrels of 41° gravity oil in 24 hours. The producing section is poorly developed with the sand in thin lenses interbedded with shale. The future extent of this field is uncertain as only the discovery well was completed by the end of the year.

Choudrant field (Lincoln Parish, Louisiana).—The discovery well was located after seismic surveys by the California Company. The field was opened by the California Company's I. R. Richards No. 1, Sec. 11, T. 18 N., R. 2 W. Casing perforations from 9,097 to 9,104 feet, 9,109 to 9,116 feet, 9,121 to 9,129 feet, and 9,133 to 9,144 feet flowed 211 barrels of 53.6° gravity distillate daily through a ¼-inch tubing choke. The gas-oil ratio was 21,850:1. Casing pressure was 3,600 pounds and tubing pressure 4,300 pounds. This is the third deep Cotton Valley field discovered by the California Company in this parish in recent years. The Choudrant field is 6 miles northeast of Ruston, parish seat of Lincoln Parish. The

Tremont distillate field is 5 miles east. The discovery well was the only producer by the end of 1946.

IMPORTANT DEVELOPMENTS IN OLD FIELDS

Haynesville field (Claiborne Parish, Louisiana).—One of the more important developments during 1946 was the discovery of deep Smackover limestone oil production in this field. The Ohio Oil Company's Bond-Beene Unit No. H-1, Sec. 22, T. 23 N., R. 8 W., was completed on April 13, 1946, flowing 435 barrels of 51° gravity oil through a 16/64-inch tubing choke. Casing was perforated from 9,943 to 10,130 feet with 447 shots. Casing pressure was 3,800 pounds, tubing pressure 4,100 pounds, and rock pressure 4,700 pounds.

One previous Smackover test had been drilled in the field. This was the Ohio-Gulf's Taylor No. 15, Sec. 15, T. 23 N. ,R. 8 W., which was drilled to 11,274 feet in 1940. The Bond-Beene well is 3,800 feet southwest of the Taylor No. 15. The Smackover limestone was encountered at 9,803 feet (−9,470 feet) in the Bond-Beene well. This point is 1,100 feet higher than in the Taylor No. 15. The higher structural position of the limestone is due to a loss of around 1,000 feet of section in the lower Cotton Valley and Buckner. On December 26, 1946, the second Smackover producer was brought in. This was the Ohio's De Loach No. H-1, Account 3, 1,800 feet southwest of the Bond-Beene. The De Loach well had a section similar in length to the Bond-Beene. The short sections in these two wells may be due to uplift and local erosion over the Haynesville anticline or faulting or a combination of both. Faulting, if present, is pre-Lower Cretaceous as no evidence of displacement can be noted in Lower Cretaceous beds. Further development will be required definitely to decide this point.

An extensive lease play was initiated on the completion of the Bond-Beene well. It was hoped that other large structures in the area would be proved productive of oil in the Smackover. This is the first oil production in Louisiana from the Smackover. Previously, distillate production had been secured from the Smackover in the North Lisbon field, Claiborne Parish, 25 miles southeast. Rapid pressure decline and extreme drilling depths made the exploitation of the Smackover unattractive in that field.

Wesson field (Columbia County, Arkansas).—During the year, 40 oil wells were completed. The Nacatoch, Tokio, upper Glen Rose, James limestone, and the Hosston were added as productive zones. At the end of the year the productive area covered about 640 acres. Structurally the field is a fault closure against the South Arkansas fault graben. In the number and thickness of producing sands this is one of the richer small fields in Arkansas. The upper Glen Rose oil well was Lee and Burnett's Foster No. 1, Sec. 19, T. 15 S., R. 18 W. The producing sand lies 75 feet above the Ferry Lake anhydrite and on the downthrown side of the fault. The upper Glen Rose including the Ferry Lake is not present on the upthrown side of the fault, having been eroded during the post-Comanche-pre-Gulf Cretaceous erosional break while equivalent beds in the downthrown block

were preserved from erosion. The major movement along the fault was pre-Upper Cretaceous. This condition has been noted at several places along the South Arkansas fault graben.

IMPORTANT DEEP TESTS IN FIELDS

Lake St. John field (Concordia and Tensas parishes, Louisiana). The California Company's D. V. Applegate No. 7, Sec. 14, T. 9 N., R. 10 E., was an important deep test in the Lake St. John field. The well was completed on March 16, 1946, at the total depth of 12,847 feet. The deepest previous test was drilled to 10,430 feet, at which depth 510 feet of the Paluxy was penetrated. The Applegate No. 7 topped the Paluxy at 9,710 feet, the base of the Ferry Lake anhydrite at 12,291 feet (−12,221 feet), and the Rodessa porosity at 12,635 feet. At the total depth the well was still in the Rodessa. This is the deepest that the Ferry Lake and Rodessa have been drilled in the Arkansas-Louisiana area. Drill-stem tests revealed no important showings in the deep formations. The well was plugged back and completed as a Tuscaloosa oil well in the regular deep producing zone.

Red River-De Soto field (De Soto Parish, Louisiana).—The Spartan Drilling Company's B. F. Thigpen No. 1, Sec. 29, T. 12 N., R. 11 W., was completed as a dry hole on January 22, 1946, at the depth of 9,178 feet. At the total depth, 500 feet of Cotton Valley was penetrated. The upper Cotton Valley was marine and contained no well developed sands. No important shows were recorded. This is the first well near the apex of this large structure to penetrate beds of Hosston and Cotton Valley age.

Little Creek field (La Salle Parish, Louisiana).—H. L. Hunt's Goodpine No. F-46 was completed as a dry hole at 6,545 feet on October 15, 1946. This well is in the northeast part of the Little Creek field. No information was released on the well. It is probable that the lower Tuscaloosa was tested. This is the first sub-Wilcox test in the field.

Zwolle field (Sabine Parish, Louisiana).—The Union Producing Company's Louisiana Long Leaf Lumber Company No. 1, Sec. 29, T. 8 N., R. 11 W., was abandoned as a dry hole at 11,265 feet. This was the first deep test in the field. At the total depth the well was in lower Hosston or upper Cotton Valley. There is inadequate deep control in the area to provide accurate correlation. The top of the Rodessa porosity was encountered at 6,010 feet and the Hosston at 7,800 feet. The Hosston was largely marine. The sand sections were poorly developed. Testing indicated no important showings and the well was abandoned on July 7, 1946.

IMPORTANT EXTENSIONS TO FIELDS

Only the more significant extensions are mentioned here. In Arkansas the McAlester Fuel Oil Company's J. G. Alexander No. A-1, Sec. 17, T. 17 S., R. 19 W., extended production in the Hosston a mile west in the Village field in Columbia County.

In Louisiana the Murphy-Sun's Holt No. A-10, Sec. 6, T. 16 N., R. 9 E., Franklin Parish, extended Tuscaloosa production in the Delhi field a mile south with the completion of a well producing 39° gravity oil with a gas-oil ratio of 22,557:1. Also in Franklin Parish, Louisiana, Bryant and Caraway's Fuller No. 1, Sec. 16, T. 16 N., R. 8 E., was completed as a gas well as a mile-south extension of the Delhi field, In Richland Parish, Louisiana, Kingwood's Sayre No. 1, Sec. 34, T. 17 N., R. 7 E., extended gas production in the Dehlco field a mile northeast.

In the Lake St. John field in Tensas Parish, Louisiana, the California Company's Ezra Scott No. 6, Sec. 44, T. 9 N., R. 10 E., was a 3-mile northwest extension of the upper Tuscaloosa distillate production and was the second well in this producing formation.

TABLE X

GEOPHYSICAL ACTIVITY, 1946
(Crew Weeks by Months)

Month	*Seismograph*	*Gravity Meter*	*Magnetometer*	*Core Drill*	*Total*
			ARKANSAS		
January	29	5	5	4	43
February	18	2	4	3	27
March	17	0	4	2	23
April	21	0	4	1	26
May	25	0	5	5	35
June	23	3	4	4	34
July	17	6	4	4	31
August	33	10	5	5	53
September	33	6	4	4	47
October	33	0	5	8	46
November	44	2	4	4	54
December	40	3	4	4	51
Total	333	37	52	48	470
			NORTH LOUISIANA		
January	84	90	0	0	174
February	72	62	0	0	134
March	68	74	0	0	142
April	68	82	0	0	150
May	92	99	0	0	191
June	66	70	0	0	136
July	82	62	0	0	144
August	101	71	0	0	172
September	78	58	0	0	136
October	93	67	0	0	160
November	58	61	0	4	123
December	51	63	0	3	117
Total	913	859	0	7	1,779

GEOPHYSICAL DATA

The geophysical data for the year are summarized in Tables X, XI, and XII. It will be noted that in Arkansas the seismograph led other methods by a wide margin. In North Louisiana seismic and gravity exploration were nearly equally important. No magnetometer crews were reported from Louisiana. In Arkansas this method was found useful in exploration in the Desha basin area in the southeastern part of the state.

TABLE XI—GEOPHYSICAL ACTIVITY IN ARKANSAS, 1946 (Crew Weeks by Counties)

County	*Seismograph*	*Gravity Meter*	*Magnetometer*	*Core Drill*	*Total*
Arkansas	28	7	12	0	47
Ashley	9	0	0	0	9
Bradley	8	0	0	4	12
Calhoun	0	1	0	13	14
Chicot	9	1	0	0	10
Cleveland	2	0	4	0	6
Columbia	56	11	0	0	67
Crawford	0	2	0	0	2
Dallas	0	0	0	2	2
Desha	23	4	4	0	31
Drew	37	0	10	0	47
Franklin	0	2	0	0	2
Grant	0	0	1	2	3
Hempstead	18	0	0	0	18
Jefferson	0	0	12	0	12
Johnson	0	2	0	0	2
Lafayette	31	0	0	0	31
Lincoln	7	0	9	0	16
Little River	21	0	0	0	21
Miller	15	0	0	4	19
Monroe	1	0	0	0	1
Nevada	12	1	0	6	19
Ouachita	7	0	0	0	7
Phillips	8	0	0	0	8
Union	41	6	0	17	64
Total	333	37	52	48	470

TABLE XII—GEOPHYSICAL ACTIVITY IN NORTH LOUISIANA, 1946 (Crew Weeks by Parishes)

Parish	*Seismograph*	*Gravity Meter*	*Magnetometer*	*Core Drill*	*Total*
Bienville	61	61	0	0	122
Bossier	53	35	0	0	88
Caddo	19	6	0	0	25
Caldwell	4	52	0	0	56
Catahoula	22	26	0	0	48
Claiborne	56	73	0	3	132
Concordia	40	61	0	0	101
De Soto	68	3	0	0	71
East Carroll	5	12	0	4	21
Franklin	49	19	0	0	68
Grant	69	38	0	0	107
Jackson	42	46	0	0	88
La Salle	11	23	0	0	34
Lincoln	26	55	0	0	81
Madison	37	10	0	0	47
Morehouse	0	21	0	0	21
Natchitoches	40	46	0	0	86
Ouachita	27	46	0	0	73
Red River	8	18	0	0	26
Richland	18	16	0	0	34
Sabine	14	9	0	0	23
Tensas	8	11	0	0	19
Union	97	62	0	0	159
Webster	69	38	0	0	107
West Carroll	0	1	0	0	1
Winn	70	71	0	0	141
Total	913	859	0	7	1,779

EXPLORATORY METHODS RESULTING IN NEW DISCOVERIES

Subsurface exploration was responsible for 14 of the 26 new discoveries recorded for the year. These data are recorded in Table XIII.

TABLE XIII—NEW DISCOVERY METHODS

	Subsurface	*Subsurface and Core Drill*	*Seismograph*	*Gravity Meter and Seismograph*	*Core Drill and Seismograph*	*Trend Drilling*	*Pool Well*	*Deep Test—Old Field*
Number of new discoveries	14	1		1		1	5	1

LEASING ACTIVITY

Table XIV lists the total number of acres acquired during 1946 with comparative figures for the preceding 2 years.

TABLE XIV—ACRES ACQUIRED

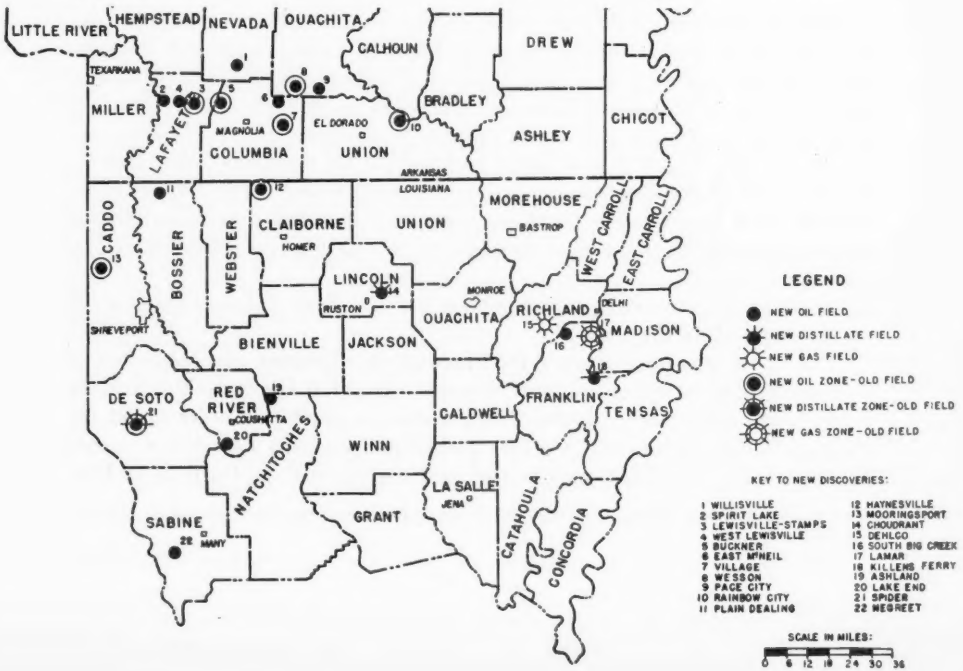
	1944	*1945*	*1946*
Arkansas	857,917	954,857	553,161
North Louisiana	1,959,806	2,894,770	1,976,219

A return to a more normal volume of leasing is noted after the heavy lease play in 1945 in the Desha basin area of southeastern Arkansas and the Delhi trend of northeastern Louisiana.

PUBLICATIONS

In 1946 the Shreveport Geological Society published Volume 1 of a two-volume work entitled "Reference Report on Certain Oil and Gas Fields of North Louisiana, South Arkansas, Mississippi, and Alabama."[3] This book contains structure maps on 65 oil and gas fields, 3 regional electrical-log cross sections, and an index map. A type electrical log is shown for each field. This is an important contribution to the geologic literature of the area it covers and should be an invaluable aid to those interested in the geology of the oil fields of this region. Volume 2 is to be published in April, 1947.

[3] E. Floyd Miller, Review of "Reference Report on Certain Oil and Gas Fields of North Louisiana, South Arkansas, Mississippi, and Alabama," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 31 (1947), pp. 529–30.



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DEVELOPMENTS IN ATLANTIC COAST STATES BETWEEN NEW JERSEY AND NORTH CAROLINA IN 1946[1]

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ABSTRACT

Although no oil was discovered in the Coastal Plain of these states, there was considerable activity in leasing as well as some geological and geophysical work. Also, 7 wells were drilled during 1946, all dry. The most significant test was that of Standard Oil Company (New Jersey) at Cape Hatteras, Dare County, North Carolina, which reached the total depth of 10,054 feet, with "basement" at 9,878 feet. The Carolina Petroleum Company drilled 5 wells near Merrimon, Cartaret County, North Carolina, all of which reached "basement" at about 4,000 feet. The Standard also drilled a dry hole near Ocean City, Worcester County, Maryland. This well was abandoned at 7,710 feet in the Cretaceous. The Rose Hill oil field of Lee County in extreme western Virginia continued to produce oil, but no figures are available.

INTRODUCTION

These states (New Jersey, Delaware, Maryland, Virginia, and North Carolina) are treated for the first time in this series of reports. Although some oil has been produced from the Appalachian region of Virginia, none has been found on the Coastal Plain between New Jersey and North Carolina. On the other hand, the Coastal Plain saw considerable activity in leasing as well as some geological and geophysical work; also 7 wells were drilled during 1946; all were dry.

NORTH CAROLINA

Undoubtedly the most significant work was done in North Carolina. In 1944 the State of North Carolina, through the Board of Conservation and Development and the Board of Education, divided the State-owned coastal land into three sections. All State-controlled lands and public water bodies east of the 77th meridian and north of a line drawn through Washington, North Carolina, and the tip of Cape Hatteras were leased to Standard Oil Company (New Jersey). Furthermore, all State-owned lands and public water bodies south of a line drawn through New Bern, North Carolina, and Ocracoke Inlet were leased to the Coastal Plains Company, a local organization. The part between was retained by the State.

Furthermore, these companies as well as various others, obtained many leases on private lands in the state.

During the preceding 2 years, the Standard Oil Company had conducted an intensive geological and geophysical research program; it finally decided to make its first well a test and to locate it as far east as possible in order to get the thickest section. Accordingly the first well (North Carolina Esso No. 1, named Hatteras Light well No. 1) was located near the tip of Cape Hatteras in Dare

[1] Manuscript received, March 16, 1947. Presented by title before the Association at Los Angeles, March 24–27, 1947.

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County. Drilling was started about December 1, 1945, and completed on July 19, 1946, when it was definitely determined that granite had been reached. The total depth was 10,054 feet, with the Cretaceous-basement contact at 9,878 feet.

No indications of oil or gas were found in the well. On the other hand, the geological data obtained were of considerable importance. The slope of the basement rock was steeper than had been anticipated by most geologists. There was a consequent thickening of the Cretaceous, with marine faunas of both Upper and Lower Cretaceous being represented.

At present, the Standard is engaged in drilling its second North Carolina well

SUMMARY OF COASTAL PLAIN EXPLORATION

County	*Location*	*Company*	*Name of Well*	*Elev. (Feet)*	*Total Depth (Feet)*	*Depth in Feet to Basement*	*Dates*
NORTH CAROLINA							
Dare	Cape Hatteras (near old lighthouse)	Standard (N. J.)	North Carolina-Esso No. 1	24	10,054	9,878	12-1-45 7-19-46
Cartaret	½ mi. N. Merrimon	Carolina Petroleum Company	Guy Carraway	15	4,069	4,053	6-9 7-20
Cartaret	2 mi. SE. Merrimon	Carolina Petroleum Company	Anita Carraway	15	4,126	4,120	8-5 8-21
Cartaret	1½ mi. N. Merrimon	Carolina Petroleum Company	Phillips-State	13	3,964	3,946	9-1 9-19
Cartaret	1½ mi. N. Merrimon	Carolina Petroleum Company	H. B. Salter	13	3,963	3,954	10-3 10-31
Cartaret	1 mi. E. Phillips-State well	Carolina Petroleum Company	John Wallace	11	4,024	4,015	12-2 12-22
MARYLAND							
Worcester	5 mi. N. Ocean City	Standard (N. J.)	Maryland Esso No. 1	13	7,710	—	10-13 12-24

(North Carolina Esso No. 2), which is located in 5 feet of water in Pamlico Sound, about 11 miles south of Roanoke Island, Dare County, and 32 miles north of the first well.

The Coastal Plains Company had previously drilled a well in North Carolina (1945) through a "farm out" (Karsten No. 1 Laughton) near Morehead City, Cartaret County. This well had reached basement at 4,036 feet. During 1946, the Carolina Petroleum Company, by arrangement with the Coastal Plains Company, drilled 5 wells near Merrimon in Cartaret County, all reaching basement at about 4,000 feet. Slight odors of gas and oil and ether cuts of oil and fluorescence were reported by the company from several horizons in various wells, but these reported showings have not been proved beyond question to be petroleum. Further drilling is planned by this company for 1947.

MARYLAND

One oil test was drilled in Maryland during 1946. This was the Maryland Esso No. 1, about 5 miles north of Ocean City, Worcester County. This was drilled on a private lease by the Standard Oil Company (New Jersey). The well was abandoned at 7,710 feet in the Lower (?) Cretaceous without any traces of

oil or gas. One interesting feature of this well was the probable presence of marine Lower Cretaceous.

No oil tests were drilled in New Jersey, Delaware, or Coastal Plain Virginia, although there was some activity in leasing.

APPALACHIAN REGION OF VIRGINIA[3]

Petroleum was first produced in Virginia in the summer of 1942 when two small wells were completed in the Rose Hill area of Lee County in the extreme southwestern part of the state. A third producer was drilled in 1945. These wells were operated by the Virginia-Lee Oil Company. In the summer of 1946, these wells together with all holdings of the Virginia-Lee Oil Company were taken over by the Rouge Oil Company (Middlesboro, Kentucky). Between June, 1946, and January 1, 1947, the Rouge Oil Company completed the drilling of 6 new tests and deepened a dry well of the Virginia-Lee Company. Although the Rouge Oil Company has not released any information, the six new wells are reported to have produced oil, while the deepened well was dry. It is said that the oil is produced from the Trenton limestone (Ordovician) at depths ranging from 1,100 to 1,350 feet, but apparently from different beds. The oil, like that from the Virginia-Lee Company wells, is reported to be of paraffine base, A.P.I. 44° gravity. All these wells are close together in an area designated as the Rose Hill oil field, which is a small window or fenster in an overthrust structure (Cumberland Overthrust block).[4]

Also, during 1946, two exploratory tests were drilled for natural gas near Bergton in Rockingham County, but results were negative.

[3] Based on information supplied by William M. McGill, assistant State geologist of Virginia.

[4] R. L. Miller, and J. O. Fuller, "Geology of the Rose Hill Oil Field, Lee County, Virginia," *U. S. Geol. Survey Map 20*, Oil and Gas Inves. Ser. (1944); released 1945.

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Box 2437 Terminal Annex, Los Angeles 54
Secretary-Treasurer - - - Clifton W. Johnson
430 Richfield Building, Los Angeles 13

Monthly Luncheons: First Thursday each month, Clark Hotel, 426 South Hill St., Los Angeles

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1024 Continental Oil Building
Secretary-Treasurer - - - - - - N. W. Bass
U. S. Geological Survey, 314 Boston Bldg.

Evening dinner (6:30) and technical program (8:00) first Tuesday each month or by announcement.

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Box 841
TALLAHASSEE, FLORIDA

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The Texas Company, Box 21
Secretary-Treasurer - - - - - Lois J. Schulz
The California Company, Box 371

Meetings will be announced. Visiting geologists and friends are welcome.

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ILLINOIS GEOLOGICAL SOCIETY

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Vice-President - - - - - - John B. Patton
Magnolia Petroleum Company
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Secretary-Treasurer - - - - - Charles Doh
Schlumberger Well Surveying Corporation
Box 571, Mattoon

Meetings will be announced.

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KANSAS GEOLOGICAL SOCIETY
WICHITA, KANSAS

President - - - - - - - - E. Gail Carpenter
Consulting, 240 N. Pinecrest

Vice-President - - - - - - - Lee H. Cornell
Stanolind Oil and Gas Company

Secretary-Treasurer - - - - - Don W. Payne
Sinclair Prairie Oil Company

Regular Meetings: 7:30 P.M., Geological Room, University of Wichita, first Tuesday of each month. The Society sponsors the Kansas Well Log Bureau, 412 Union National Bank Building, and the Kansas Well Sample Bureau, 137 North Topeka.

LOUISIANA

THE SHREVEPORT GEOLOGICAL SOCIETY
SHREVEPORT, LOUISIANA

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Carter Oil Company

Vice-President - - - - - - - Brame Womack
Sohio Petroleum Corporation

Secretary-Treasurer - - - - - - J. Ed. Lytle
Union Producing Company

Meets monthly, September to May, inclusive, in the State Exhibit Building, Fair Grounds. All meetings by announcement.

MICHIGAN

MICHIGAN GEOLOGICAL SOCIETY

President - - - - - - - - - Rex P. Grant
Michigan Geological Survey
Capitol Savings and Loan Bldg., Lansing

Vice-President - - - - - - Richard H. Wolcott
Sohio Petroleum Company, Mt. Pleasant

Secretary-Treasurer - - - - - Charles K. Clark
Pure Oil Company
402 2d Natl. Bank Bldg., Saginaw

Business Manager - - - - Kenneth A. Gravelle
Gulf Refining Company, Box 811, Saginaw

Meetings: Monthly, November through May, at Michigan State College, East Lansing, Michigan. Informal dinners at 6:30 P.M., followed by discussions. Visiting geologists are welcome.

INDIANA-KENTUCKY

INDIANA-KENTUCKY GEOLOGICAL SOCIETY
EVANSVILLE, INDIANA

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Owensboro, Kentucky

Vice-President - - - - - - - George E. Taylor
Continental Oil Company, 606 Division St.
Evansville, Indiana

Secretary-Treasurer - - - - - - P. L. Keller
Great Lakes Carbon Company, American Bldg.
Evansville, Indiana

Meetings will be announced.

LOUISIANA

NEW ORLEANS GEOLOGICAL SOCIETY
NEW ORLEANS, LOUISIANA

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Houston Oil Company of Texas
1701 Pere Marquette Bldg.

Vice-President and Program Chairman - - -
- - - - - - - - - - - - Joe B. Hudson
Humble Oil and Refining Company

Secretary-Treasurer - - - - D. N. Rockwood
Union Producing Company

Meets the first Monday of every month, October-May inclusive, 7:30 P.M., St. Charles Hotel. Special meetings by announcement. Visiting geologists cordially invited.

LOUISIANA

SOUTH LOUISIANA GEOLOGICAL SOCIETY
LAKE CHARLES, LOUISIANA

President - - - - - - - - - Bruce M. Choate
Atlantic Refining Company

Vice-President - - - - - - - - Roy A. Payne
Gulf Oil Corporation

Secretary - - - - - - - - - W. Farrin Hoover
Stanolind Oil and Gas Company, Box 54

Treasurer - - - - - - - - - W. B. Neill
Stanolind Oil and Gas Company

Meetings: Dinner and business meetings third Tuesday of each month at 7:00 P.M. at the Majestic Hotel. Special meetings by announcement. Visiting geologists are welcome.

MISSISSIPPI

MISSISSIPPI GEOLOGICAL SOCIETY
JACKSON, MISSISSIPPI

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Mellen & Monsour
Box 2571, W. Jackson Sta.

Vice-President - - - - - - - - J. B. Wheeler
Stanolind Oil and Gas Company

Secretary-Treasurer - - - - - - H. L. Spyres
Skelly Oil Company

Meetings: First and third Thursdays of each month, from October to May, inclusive, at 7:30 P.M., Edwards Hotel, Jackson, Mississippi. Visiting geologists welcome to all meetings.

OKLAHOMA

ARDMORE GEOLOGICAL SOCIETY

ARDMORE, OKLAHOMA

President - - - - - - - - Robert W. Kline
Sinclair Prairie Oil Company, Box 978

Vice-President - - - - - - - - B. W. James
Phillips Petroleum Company, Box 958

Secretary-Treasurer - - - Murrell D. Thomas
The Texas Company, Box 539

Dinner meetings will be held at 7:00 P.M. on the first Wednesday of every month from October to May, inclusive, at the Ardmore Hotel.

OKLAHOMA CITY GEOLOGICAL SOCIETY

OKLAHOMA CITY, OKLAHOMA

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Carter Oil Company

Vice-President - - - - - - - - - Harold J. Kleen
Skelly Oil Company

Secretary-Treasurer - - - - - Frederick H. Kate
Shell Oil Company, Inc.
965 First National Building

Meetings: Technical program each month, subject to call by Program Committee, Oklahoma City University, 24th Street and Blackwelder. Luncheons: Every second and fourth Thursday of each month, at 12:00 noon. Y.W.C.A.

SHAWNEE GEOLOGICAL SOCIETY

SHAWNEE, OKLAHOMA

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Atlantic Refining Company, Box 166,
Shawnee

Vice-President - - - - - - - Fred J. Smith
Sinclair Prairie Oil Company
Box 991, Seminole

Secretary-Treasurer - - - - Marcelle Mousley
Atlantic Refining Company, Box 169
Shawnee

Meets the fourth Thursday of each month at 8:00 P.M., at the Aldridge Hotel. Visiting geologists welcome.

TULSA GEOLOGICAL SOCIETY

TULSA, OKLAHOMA

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Consulting Geologist, 922 Thompson Building

1st Vice-President - - - - - - Jerry E. Upp
Amerada Petroleum Corporation, Box 2040

2nd Vice-President - - - - - - L. E. Fitts, Jr.
Sinclair Prairie Oil Company, Box 521

Secretary-Treasurer - - - - - - V. L. Frost
Ohio Oil Company, Thompson Building

Editor - - - - - - - - - Robert F. Walters
Box 661, Gulf Oil Corporation

Meetings: First and third Mondays, each month, from October to May, inclusive at 8:00 P.M., University of Tulsa, Kendall Hall Auditorium. Luncheons: Every Friday (October-May), Chamber of Commerce Building.

PENNSYLVANIA

PITTSBURGH GEOLOGICAL SOCIETY

PITTSBURGH, PENNSYLVANIA

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United States Engineers, 925 New Federal Bldg.

Vice-President - - - - - - - John T. Galey
Independent, Box 1675

Secretary - - - - - - - - - David K. Kirk
Gulf Research and Development Co., Box 2038

Treasurer - - - - - - - - C. H. Feldmiller
Equitable Gas Company, 425 Sixth Ave.

Meetings held each month, except during the summer. All meetings and other activities by special announcement.

TEXAS

PANHANDLE GEOLOGICAL SOCIETY

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Sinclair Prairie Oil Company, Box 1242

Secretary-Treasurer - - - - - Robert J. Gutru
Cities Service Oil Company, Box 350

Meetings: Luncheon 1st and 3d Wednesdays of each month, 12:00 noon, Herring Hotel. Special night meetings by announcement.

TEXAS

CORPUS CHRISTI GEOLOGICAL SOCIETY

CORPUS CHRISTI, TEXAS

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The Texas Company, 902 Jones Building

Vice-President - - - - - - Dale L. Benson
Sinclair Prairie Oil Company, Box 480

Secretary-Treasurer - - - - - O. G. McClain
Consultant, 224 Nixon Building

Regular luncheons, every Wednesday, Petroleum Room, Plaza Hotel, 12:05 Special night meetings by announcement.

DALLAS GEOLOGICAL SOCIETY

DALLAS, TEXAS

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Meyer and Achtschin
502 Continental Building

Vice President - - - - - - John M. Clayton
Seaboard Oil Company
1400 Continental Building

Secretary-Treasurer - - - - - W. W. Newton
Geotechnical Corporation, Box 7166

Executive Committee - - - - H. C. Vanderpool
Seaboard Oil Company

Meetings: Monthly luncheons by announcement. Special night meetings by announcement.

TEXAS

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Humble Oil and Refining Company
Vice-President - - - - - - - - L. F. Lees
Phillips Petroleum Company
Box 208
Secretary-Treasurer - - - - Walter E. Long
Magnolia Petroleum Company
Box 780

Luncheons: Each week, Monday noon, Blackstone Hotel.

Evening meetings and programs will be announced. Visiting geologists and friends are welcome.

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HOUSTON, TEXAS

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Consultant, 1713 Esperson Building
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J. M. Huber Corporation
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Secretary - - - - - - - - - A. F. Childers
Gulf Oil Corporation, Box 2100
Treasurer - - - - - - - - Wayne Z. Burkhead
Union Oil Company of California
1134 Commercial Bldg.

Regular meeting held the second and fourth Mondays at noon (12 o'clock), Mezzanine floor, Rice Hotel. For any particulars pertaining to the meetings write or call the secretary.

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SAN ANTONIO, TEXAS

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Santa Clara Oil Company
1016 South Texas Building
Vice-President - - - - - - Van A. Petty, Jr.
Petty Geophysical Company
Secretary-Treasurer - - - - - - J. Boyd Best
The Ohio Oil Company
1417 Milam Building

Meetings: One regular meeting each month in San Antonio. Luncheon every Monday noon at Milam Cafeteria, San Antonio.

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P. O. Box 2605

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1901 Kanawha Valley Building
Vice-President - - - - - - W. B. Maxwell
United Fuel Gas Company, Box 1273
Secretary-Treasurer - - - - - R. L. Alkire
605 Union Building
Editor - - - - - - - - - - J. D. Castner
Box 1433

Meetings: Second Monday, each month, except June, July, and August, at 6:30 P.M., Kanawha Hotel.

FORT WORTH GEOLOGICAL SOCIETY
FORT WORTH, TEXAS

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Box 1290
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The Texas Company, Box 1720
Secretary-Treasurer - - - - - R. W. Dudley
Pure Oil Company
Box 2107

Meetings: Luncheon at noon, Hotel Texas, first and third Mondays of each month. Visiting geologists and friends are invited and welcome at all meetings.

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Vice-President - - - - - - Lynn L. Harden
Sinclair Prairie Oil Company
Secretary-Treasurer - - - - - D. T. Richards
Consulting, 1709 Buchanan Street

Meetings: Each week, Tuesday, 12:30 P.M., Texas Electric Auditorium; Each month, first Thursday evening. Special night meetings announced. All geologists always welcome.

WEST TEXAS GEOLOGICAL SOCIETY
MIDLAND, TEXAS

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Vice-President - - - - - W. A. Waldschmidt
Argo Oil Corporation, Box 1814
Secretary-Treasurer - - - Charles F. Henderson
Stanolind Oil and Gas Company, Box 1540

Meetings will be announced.

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CASPER, WYOMING
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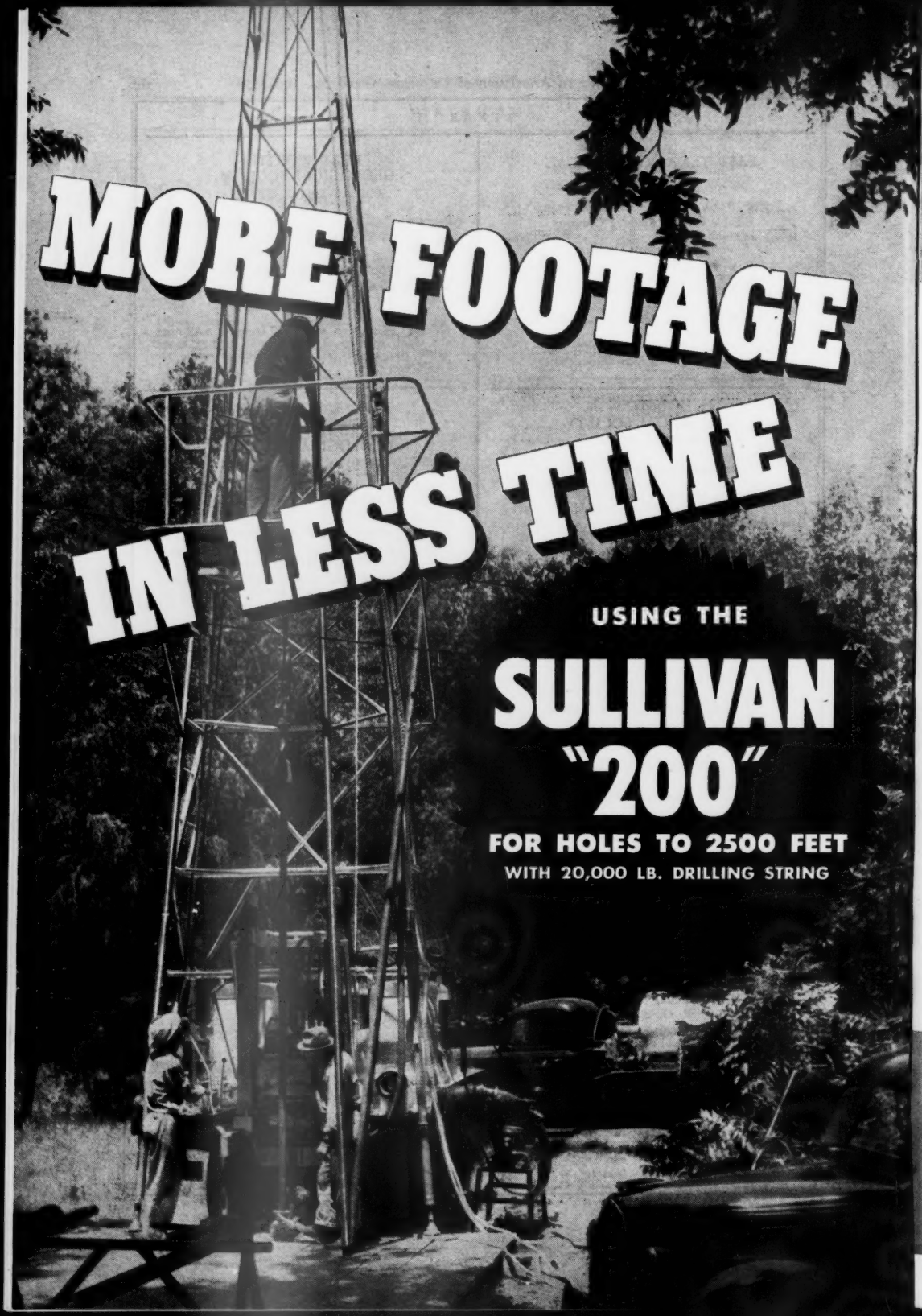
Continental Oil Company
2d Vice-President (Programs) Thomas C. Hiestand
Cities Service Oil Company
Secretary-Treasurer - - - - - George Steele
Northern Utilities Company

Informal luncheon meetings every Friday, 12 noon, Townsend Hotel. Visiting geologists welcome. Special meetings by announcement.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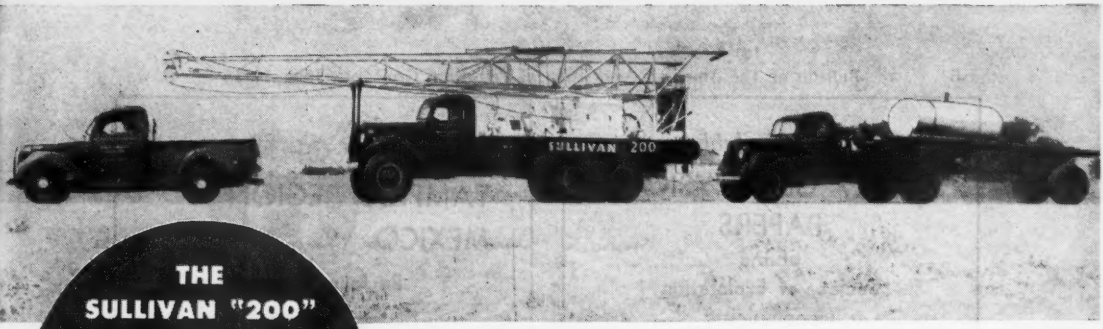

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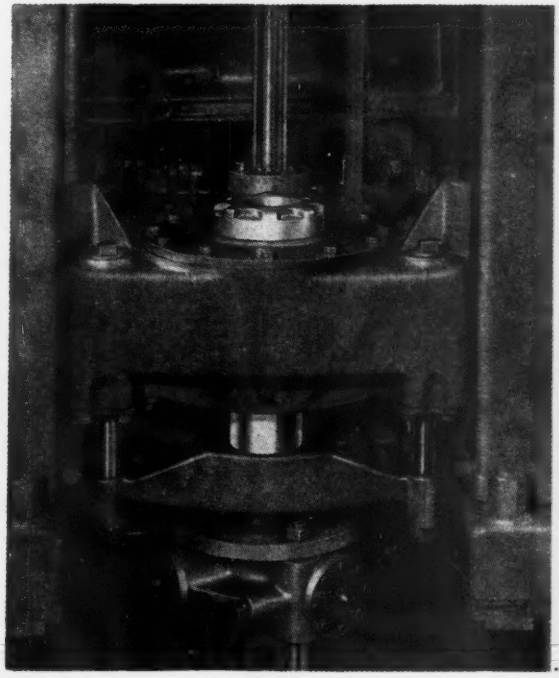

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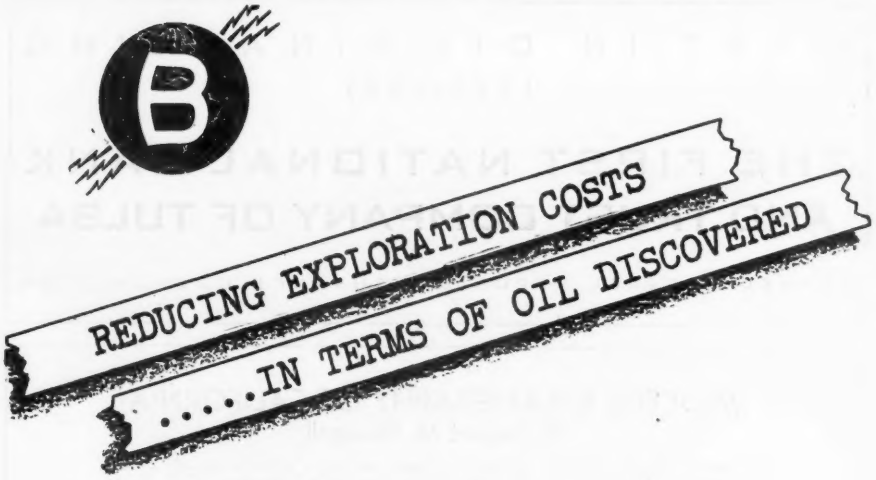

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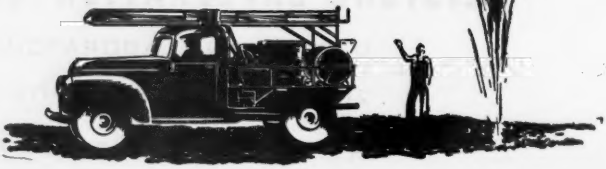

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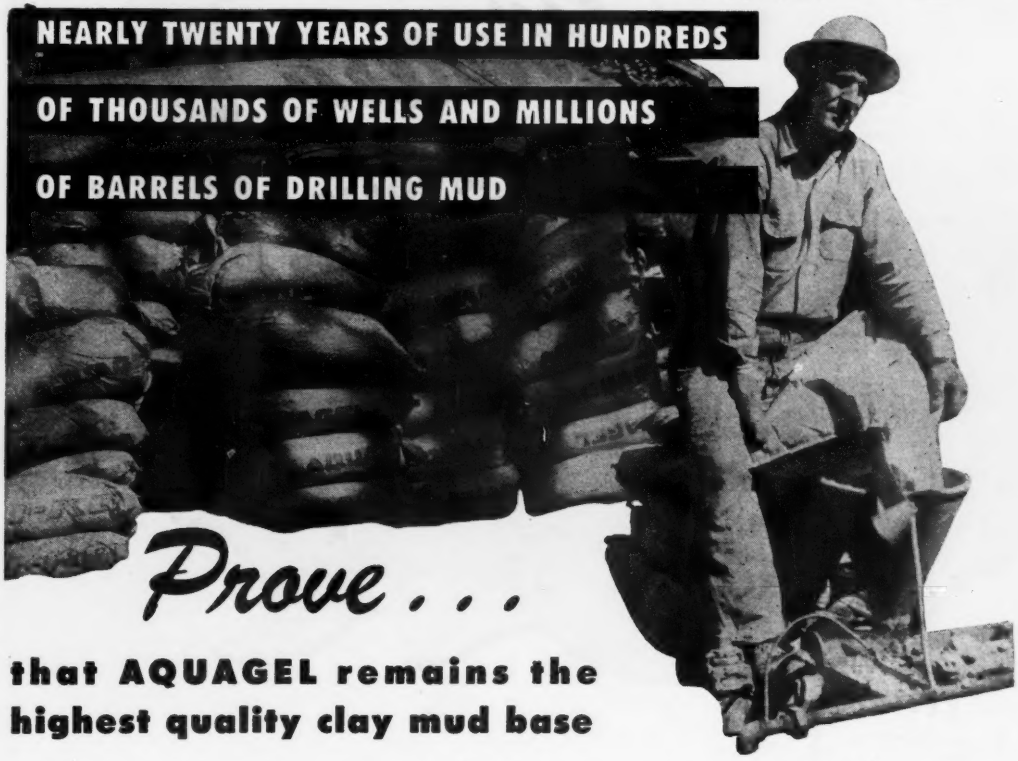

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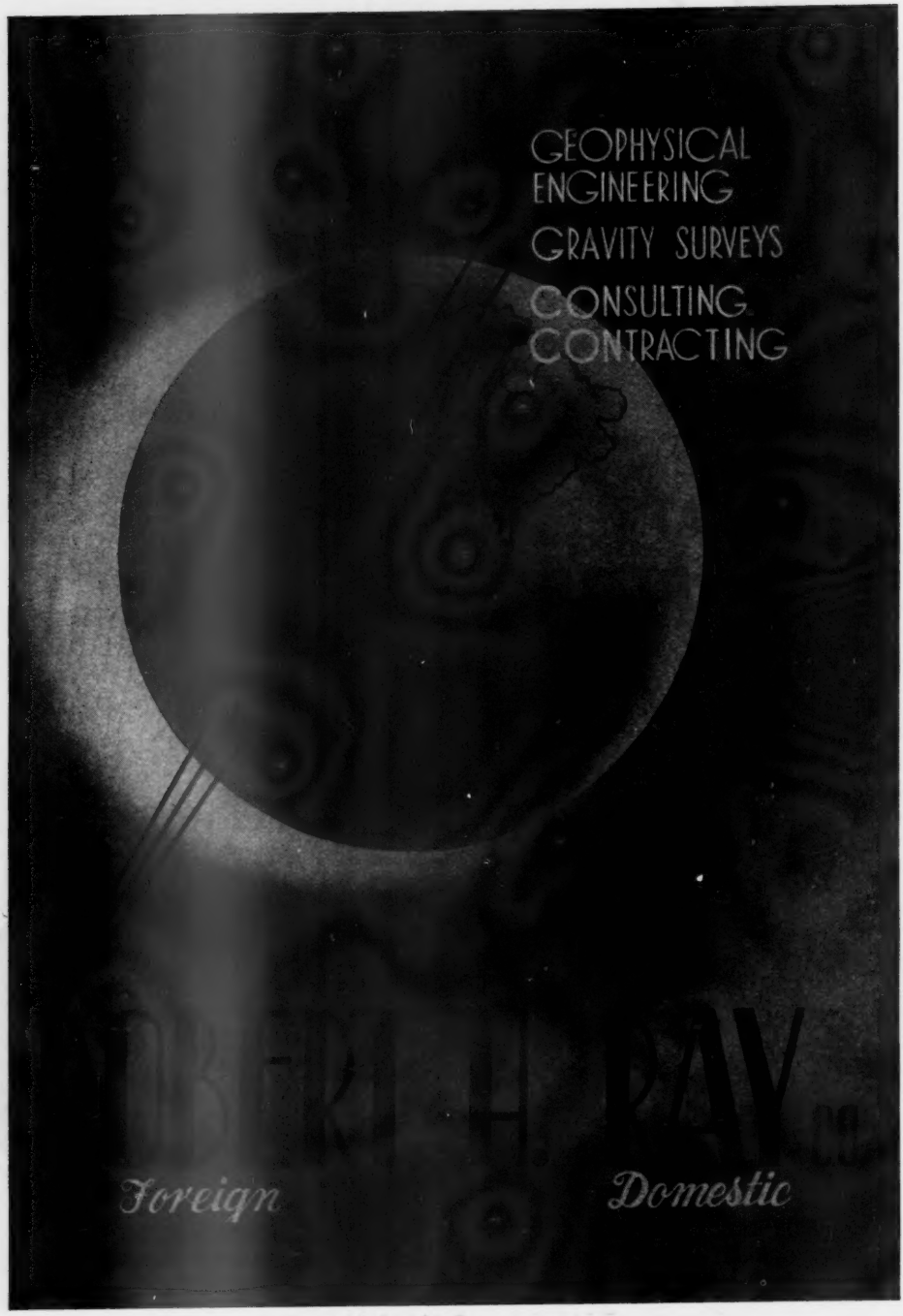
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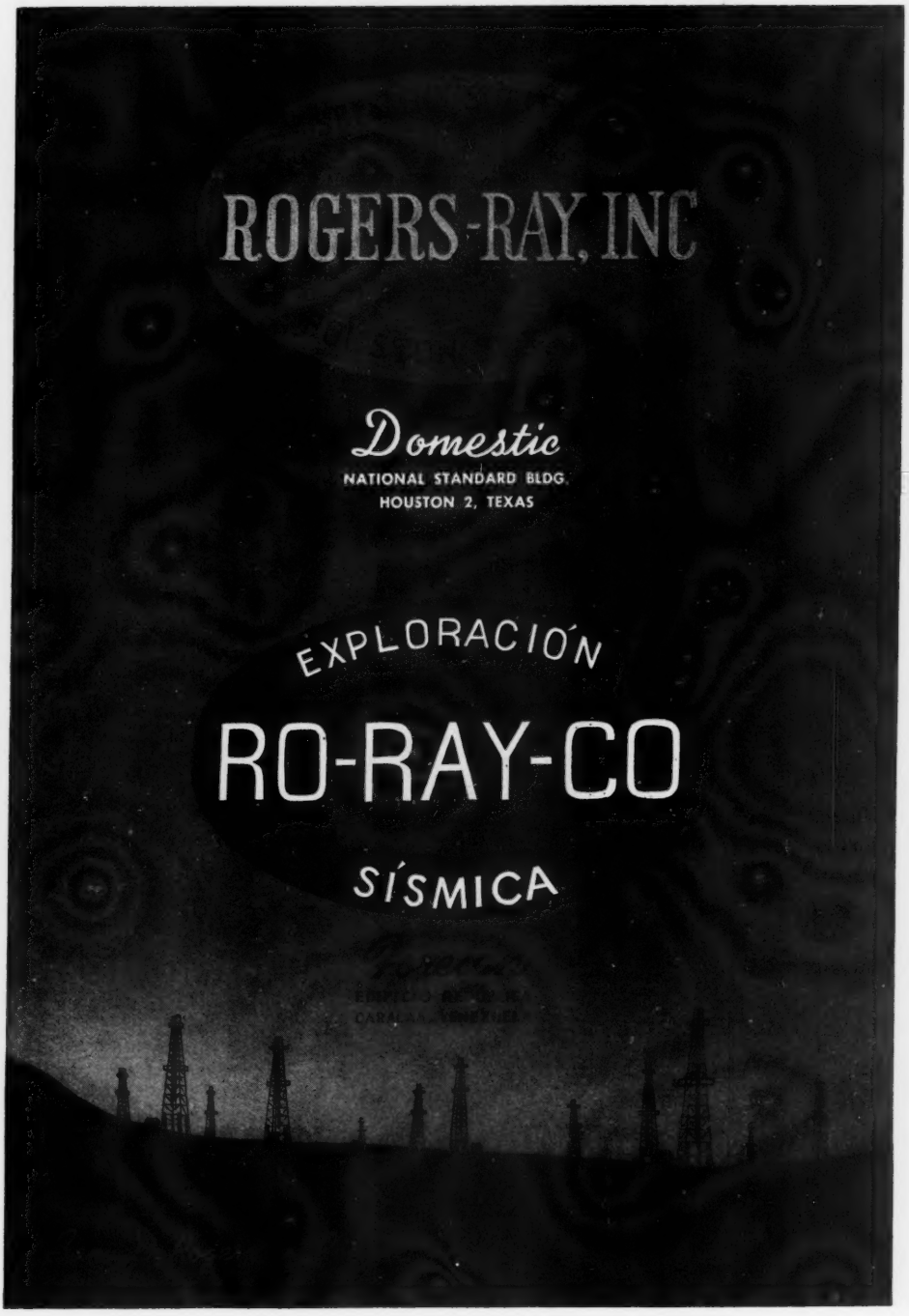
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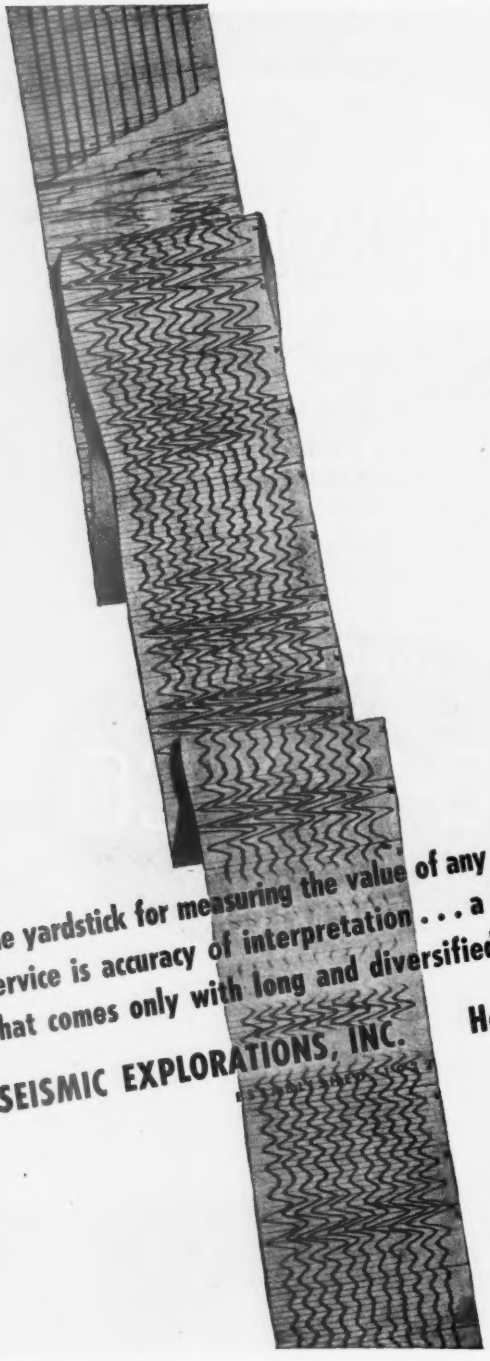

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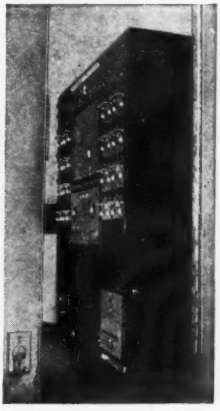

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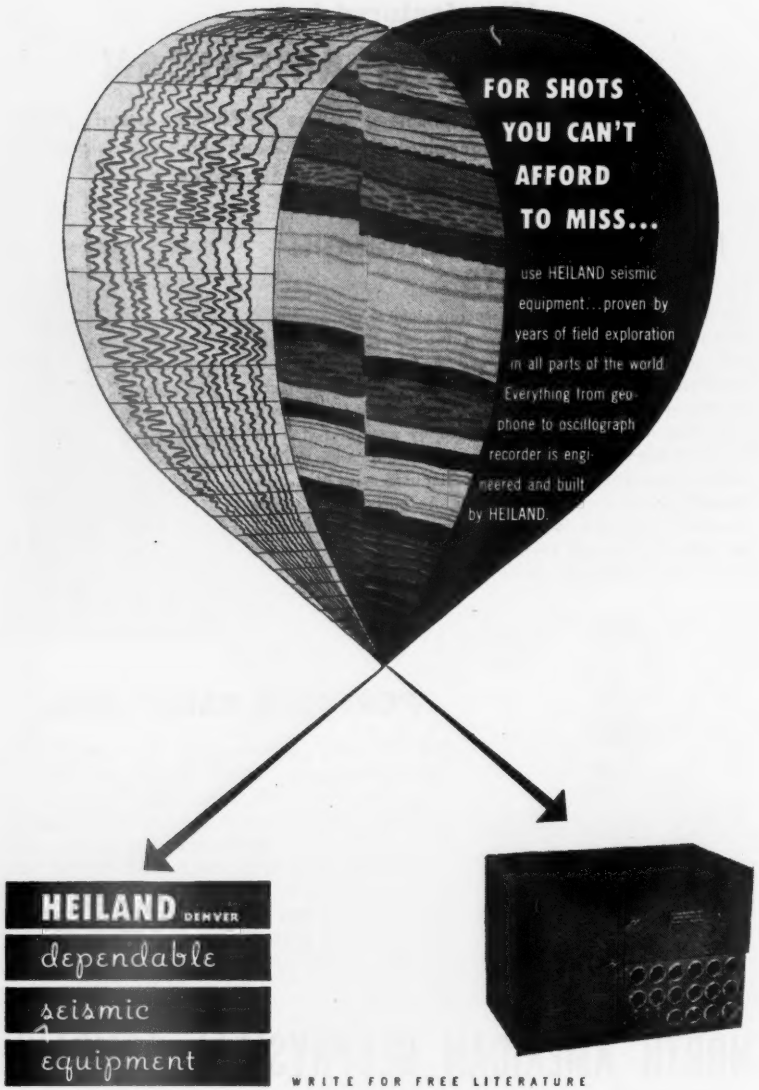
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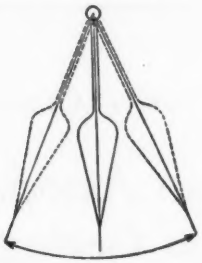

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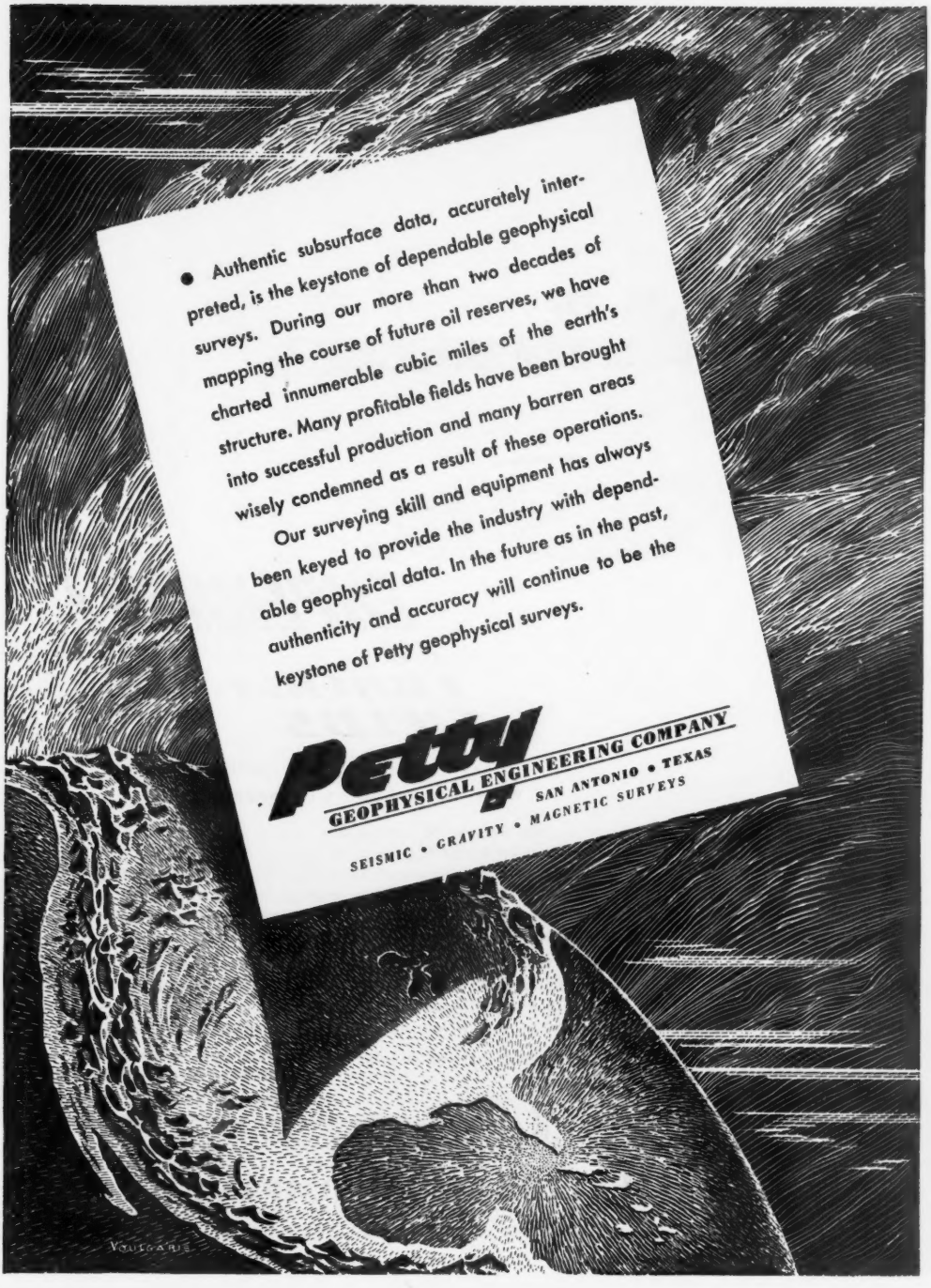
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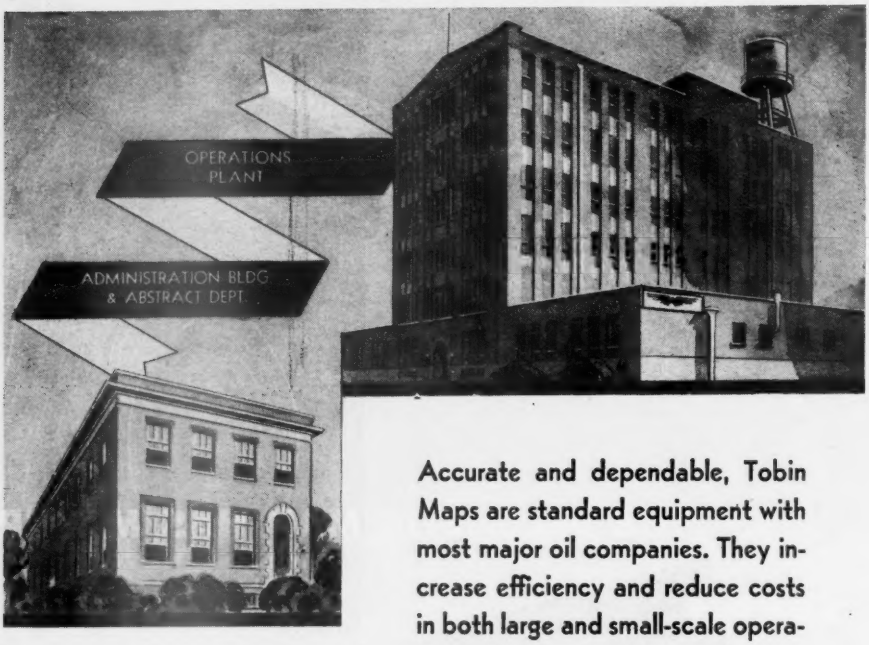

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FIG. 20.—Cerro Bernal, volcanic plug. (Reproduction of sketch by Captain G. F. Lyon, 1828; redrawn by F. S. Howell.)

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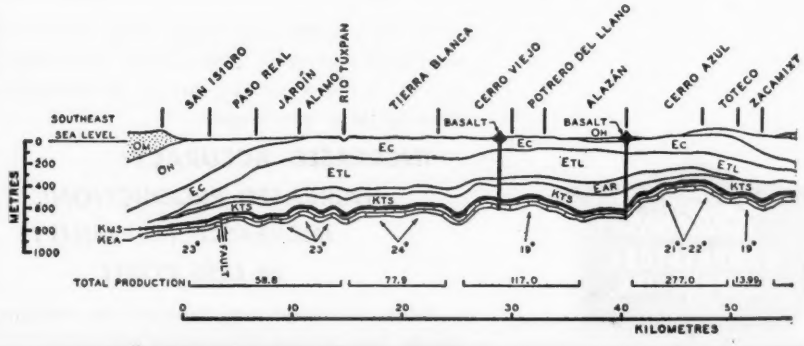

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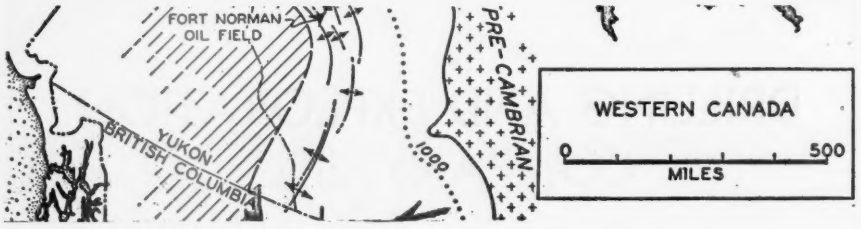

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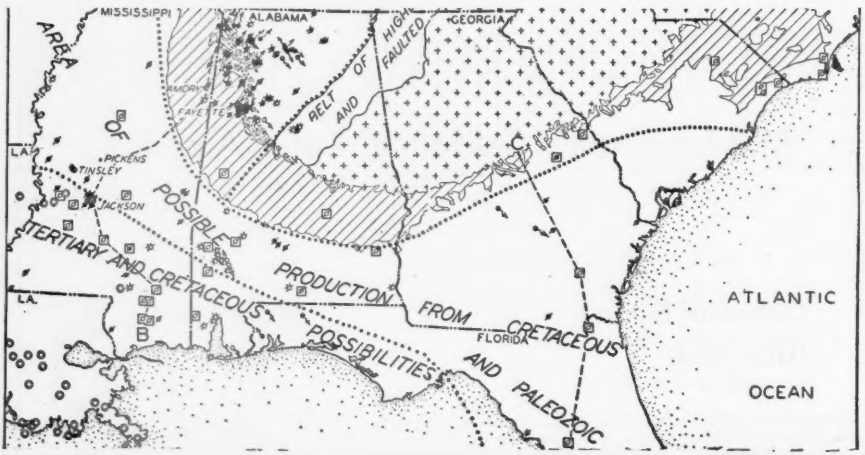

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by

F. M. VAN TUYL AND W. S. LEVINGS

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"The Neogene of California is disposed in tectonic basins, about a dozen in number, from Humboldt in the north to Los Angeles in the south. About half-way along is the Paso Robles basin, and in this lies the Reliz Canyon, which provides the author with his type section. The aerial photograph serving as frontispiece shows the area to be sufficiently arid to give a practically continuous exposure; but one must admire the painstaking determination with which so many successive associations of Foraminifera were collected, identified and tabulated. Such labour would scarcely have been thought of without the stimulus which the search for oil has given to the detailed study of Foraminifera.

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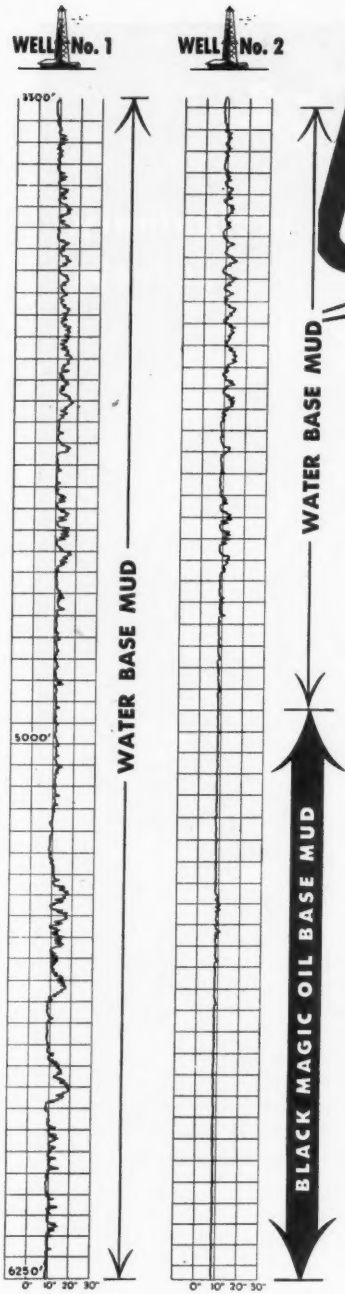

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NO. 5—140 pp. GENERAL: Two tilts. KAN.: Greenwich pool. OKLA.: Dora pool. PERU: Agua Caliente anticline. TEX.: Travis Peak formation; Fairbanks and Satsuma fields. TURKEY: Southern.

NO. 6—218 pp. REVIEW OF DEVELOPMENTS.

NO. 7—180 pp. GEN.: Rock units. KAN.: Hugoton gas. OKLA.: Arbuckle asphalt. TEX.: Panhandle gas; Carlos structure and Ferguson Crossing, Grimes and Brazos Cos.

NO. 8—124 pp. ARK.: Basilosaurus. CALIF.: Potrero Hills gas. GEN.: Rocky Mtns.; black shale. KAN.: Loess. LA.: Stream patterns. S. DAK.: Pennington Co. TEX.: Ben Bolt and Magnolia City fields, Jim Wells Co.; Muralla field, Duval Co. TRINIDAD.

NO. 9—148 pp. GEN.: Isostatic layer; electrical logging; Gulf datum planes. ILL., IND., KY.: Coals; Salem field, Marion Co. MISS.: Jackson Eocene, TEX.: Proration.

NO. 10—164 pp. ALA.: Citronelle. CALIF.: Wasco field, Kern Co. GEN.: Oligocene-Miocene. ILL.: Basin fields; Pennsylvanian; Cambrian inlier. N. MEX.: Salado formation. TEX.: Goldsmith field, Ector Co.; Salado. WYO.: Wind River Canyon.

NO. 11—148 pp. FLA.: Everglades deep test. GEN.: Permian; marine and non-marine sediments. NEB.: Permian. N. MEX.: Castile salt, potash, anhydrite. TEX.: Gulf Coast; Amelia field, Jefferson Co.; Permian.

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NO. 4—148 pp. ARK.: Dorcheat pool, Columbia Co. AUSTRALIA: Permian. CALIF.: Whittier Quadrangle; Kettleman Hills; Paloma field, Kern Co. COLO.: Permian. LA.: Sparta-Wilcox. MINN.: Pre-Cambrian, Cambrian. OHIO: Paleozoic, pre-Cambrian, Delaware Co. OKLA.: Osage, Washington, Nowata Cos.; deepest well, Washita Co. TEX.: Lissie and Beaumont, Gulf Coast; Sparta-Wilcox; shoreline, Brazoria Co.

NO. 5—188 pp. GEN.: Mississippian, Eastern Interior; geochemical exploration.

NO. 6—204 pp. RECENT DEVELOPMENTS.

NO. 7—196 pp. CALIF.: Rio Bravo field, Strand field, Kern Co. TEX.: Cretaceous ammonoids. WYO.: Oil-field waters.

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NO. 9—176 pp. CANADA: Turner Valley Paleozoic limestone. CALIF.: Bakersfield Eocene coal. COLOMBIA: Jurassic-Cretaceous. GEN.: Radioactivity of rocks; GULF: Cook Mtns. N. MEX.: Caballos novaculite. TENN.: Lower Ordovician (St. Peter). VENEZUELA: Jurassic-Cretaceous. W. INDIES: Paleogene of Barbados.

NO. 10—160 pp. CALIF.: History: Eocene Yokut sandstone. GEN.: Paleontology. KAN.: Hugoton field porosity, permeability. TEX.: Saxet field, Nueces Co.; Rogers pool and Bonita discovery, Montague Co.; Aspermont pool, Stonewall Co.

NO. 11—204 pp. CALIF.: San Joaquin Valley Eocene. GEN.: Carbohydrates of oil and coal; unconformities and accumulation. LA.: Wilcox Eocene; Neale, Beauregard Parish. MICH.: Buckeye, Gladwin Co. MISS.: Surface. OKLA.: Ramsey, Payne Co.; Billings, Noble Co. TEX.: Wilcox Eocene; Pittsburg, Camp Co. W. VA.: Devonian.

NO. 12—164 pp. CALIF.: Miocene fishes, Torrance field. GEN.: Water cones; Permian crude. LA.: Gulf heavy minerals. MICH.: Isopach, Ellsworth-Traverse limestones. OKLA.: Structural interpretation, gravity anomalies. TEX.: Gulf heavy minerals; Hoffman field, Duval Co.; Jones Co. TRINIDAD: Los Bajos fault.

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NO. 2—152 pp. CALIF.: Stratigraphy; Cretaceous; Del Valle field, Los Angeles Co. GEN.: Free oil accumulation. TEX.: Sewell-Eddleman area, Young Co.; Permian paleogeography; Eocene, Zapata Co.; Washburn field, La Salle Co.; McKee and Waddell sands, Simpson Ordovician, West Texas. UTAH: Laccolithic mountains, traps.

NO. 3—228 pp. CALIF.: Earthquake, Dominquez field, Los Angeles Co. GEN.: Member list; auditor's report. KAN.: Patterson pool, Kearny Co. MONT.: Madison Mississippian. N. DAK.: Stratigraphy. RUSSIA: Artinskian Permian. TEX.: Pre-Cretaceous, Edwards Plateau; Barnhart field, Reagan Co.

NO. 5—204 pp. CALIF.: Sutter Buttes. COLOMBIA: Honda district. GEN.: Pseudo-abyssal sediments; salty ground waters, Atlantic and Gulf coasts; oil-field waters; annual reports. MONT.: Cedar Creek anticline. TEX.: Silurian graptolite, Crane Co.

NO. 6—216 pp. RECENT DEVELOPMENTS

NO. 7—132 pp. ARK.: Developments; Midway field, Lafayette Co. GEN.: Annual addresses; exploration; geology, war, peace; teaching; drilling-time logs; appraisals, oil reservoirs. GULF: Tertiary microfossils. LA.: Developments.

NO. 8—124 pp. COLO.: Gore area. GEN.: Discovery methods. MONT.: Oil-field water. N. DAK.: Stratigraphy. TEX.: Ellenburger; Pennsylvanian anhydrite.

NO. 9—136 pp. ARK.: Schuler field, Union County. NEB.: Cretaceous. TEX.: Well spacing, Columbia field, Brazoria Co.

NO. 10—140 pp. CALIF.: Crocker Flat. COSTA RICA: Amoura shale. GEN.: Slide copy. ILL.-IA.: Pennsylvanian. ILL.-IND.: Chester sandstone; New Harmony field. LA.: Morehouse Paleozoic. DAK.: Regional. TEX.: Payton pool, Pecos and Ward Cos.

NO. 11—98 pp. GEN.: Stratigraphical analysis. TEX.: Graptolites, Crane Co.

NO. 12—98 pp. GEN.: Engineering geology; calculating thickness; annual index.

1943 **VOL. XXVII.—1,674 pp. 12 Nos. Paper. Each number.....($1.00)** 1.50

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NO. 5—134 pp. CALIF.: Tertiary. GEN.: Annual reports. GULF: Tuscaloosa formation. KAN.-OKLA.: Desmoinesian, Missourian. MICH.: Thunder Bay Traverse rocks. S. DAK.: Rapid City water wells. TEX.: Seguin formation; Dockum conglomerates.

NO. 6—172 pp. RECENT DEVELOPMENTS.

NO. 7—152 pp. GEN.: Annual addresses; developments. U.S.; cabletool logs.

NO. 8—136 pp. LA.: Anse La Butte, St. Martin Ph.; Jennings field, Acadia Ph. TENN.: Structure. TEX.: L. Cret. foraminifera and ostracoda; ground water at Houston.

NO. 9—112 pp. GEN.: Marine micro-organisms and petroleum; faults. TEX.: Pre-Trinity. W. VA.: Metamorphism of coal.

NO. 10—120 pp. CALIF.: Santa Maria district; Eocene, Chico Martinez area. GREAT PLAINS: Big Snowy group. OKLA.: Simpson graptolites. ROCKY MTNS.: Crude oils.

NO. 11—160 pp. GEN.: Aerial photographs. GULF: Jurassic. VA.: Deep well, Russell Co. W. VA.: Deep well, Harrison Co.

NO. 12—112 pp. CALIF.: Radiolarites. GEN.: Crudes. N. DAK.: Tertiary; Williston basin. OKLA.: Spavinaw granite. VENEZUELA: Fossils in metamorphics.

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NO. 4—128 pp. CALIF.: Cretaceous and Paleocene, Santa Lucia Range. KY.: "Cornif-erous," Estill Co. LA.: Grabens; developments, 1942. TEX.: Pecan Gap, Wolfe City, and Annona formations; highest structural point; grabens.

NO. 5—124 pp. GEN.: Annual reports; reserves. GULF: Cotton Valley beds.

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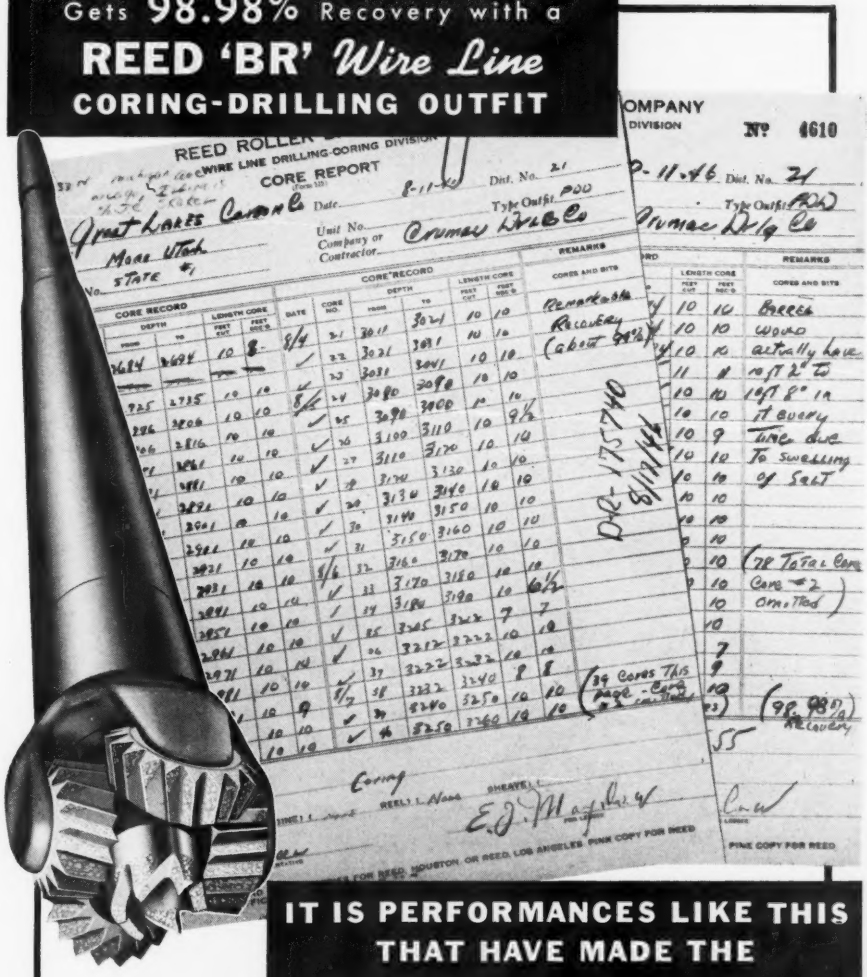

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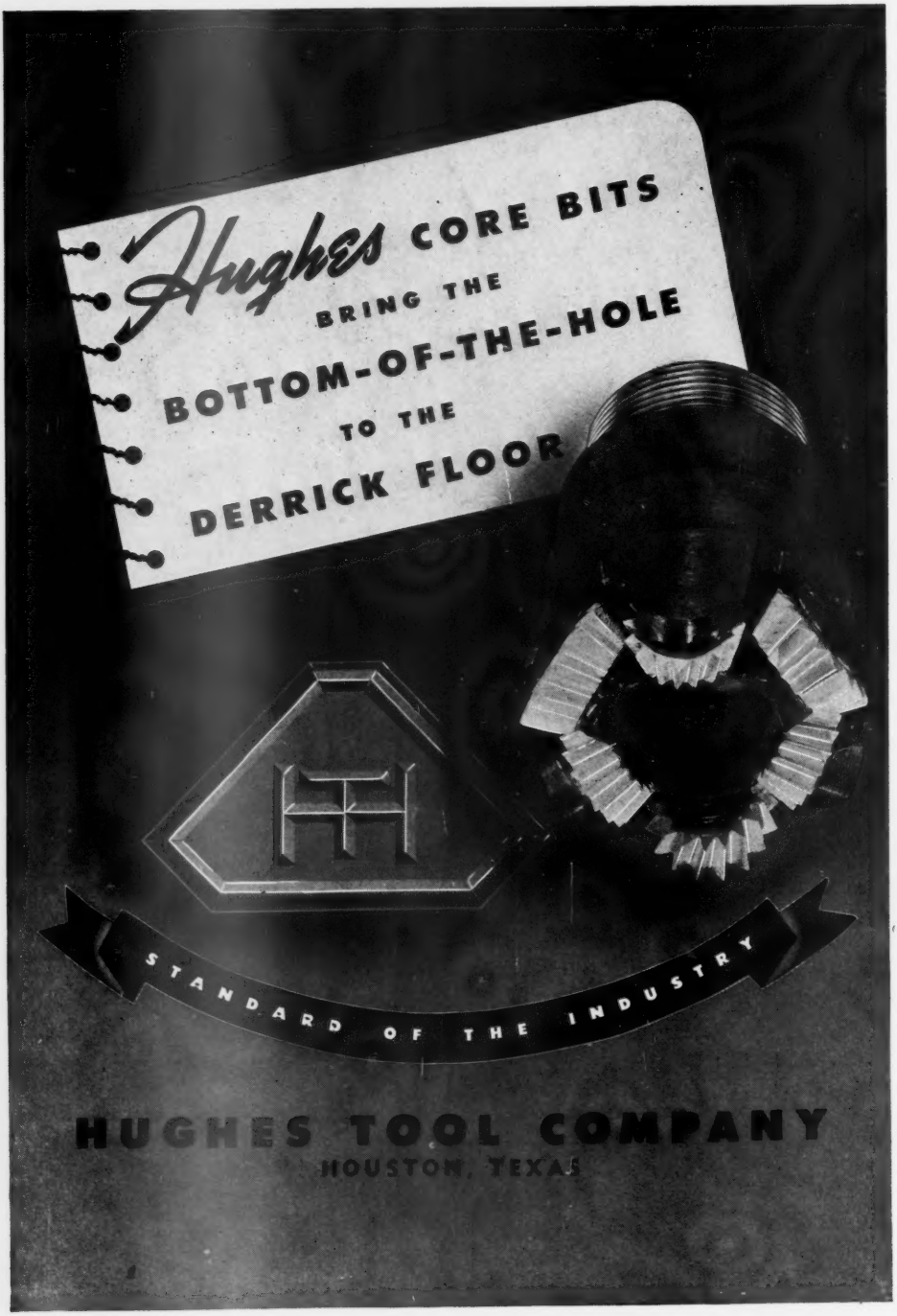
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